American Machinist

Volume 57 NEW YORK, OCTOBER 26, 1922 Number 17

International Standardization

The Four Stages of Industrial Standardization — National and International Bodies — Examples of Accomplishment — Information the Basis of Co-operation

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IN DISCUSSING so complex a subject as international standardization it is well to be explicit on fundamentals. Industrial standardization means to single out specific products and materials, to settle upon their properties and dimensions, and to concentrate upon them in production and in use—all to the end of bringing about the greatest overall industrial efficiency. This involves:

(a) Nomenclature
(b) Purchase specifications
(c) Methods of test
(d) Uniformity in dimensions necessary to secure interchangeability of supplies, and the interworking of apparatus and parts.
(e) Provisions for safety
(f) Concentration upon the optimum number of types, sizes and grades of manufactured products

According to the scale upon which it is carried out, the process of industrial standardization may be classified roughly into four stages, namely:

1. By individual firms
2. By societies or associations
3. On a national scale
4. On an international scale

The number of individuals and organizations interested in any particular piece of standardization work increases greatly as it develops from one of these stages to the next. On this account, and for many other reasons, the difficulties increase in a greater ratio from stage to stage than do the number of parties at interest. Likewise, the extent to which standardization may be carried is very much less in scope, in incisiveness, and in elaboration of detail. On the other hand, its importance industrially increases from stage to stage, and when international standardization can actually be carried out it is bound to be far-reaching in its effects.

Generally two or more of these stages develop simultaneously. In fact, all four stages may be developing at the same time. Furthermore, as a practical matter no sharp line of demarkation can be drawn between the four stages. A piece of standardization work which has been carried out by a society or an association may have been put upon so sound a basis that it becomes essentially a national standard. The same is true even of the work of individual companies. Several striking examples of the latter are to be found in the field of mechanical engineering, e.g., in tapers and wire gages.

Standardization by individual firms is now well developed in all the principal industrial countries. It is an essential element in mass production. Unquestionably up to the present it has been pushed farthest in the United States.

Standardization by societies and associations has also been greatly developed in industrial countries. In many cases standards so developed have come into such general use as to make them essentially national in character. In far more numerous cases such standards are receiving increasing recognition, but systematic co-operation and understandings with other interested bodies will be necessary to bring about full national recognition.

National Bodies. The movement for industrial standardization along national lines, although a recent one, is now getting well under way. There are now fourteen national standardizing bodies in all: in Austria, Belgium, Canada, Czecho-Slovakia, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Sweden, Switzerland and the United States. While the British Engineering Standards Association is the only one of these which antedates the World War, and some of them have been only recently organized, the opportunities and need for the work are such that more than half of them have already accomplished work of real significance and importance in the development of their national industries. The work is being woven intimately into the industrial fabric. Of the national bodies the British and the German are the largest and their work is the most extensive at the present writing.

> There are many and serious obstacles in the way of the development of international industrial standardization, such as differences in languages, racial temperament, historical and industrial background, limitations imposed by geographical conditions, the metric and English systems of weights and measures, national animosities and rivalries, exigencies of commercial conditions, ignorance on the part of industrial leaders of the significance of or even of the existence of foreign work, and the instinctive conservatism, not to say suspicion, of a large proportion of men toward new developments and ideas.

Steps in International Work. Naturally much less has yet been accomplished in international industrial standardization than in national work. Yet beginnings

have been made in several fields and in some lines substantial progress has been made. Three formal international bodies have been set up for standardization work. These are in the electrical, illumination, and aircraft fields. The national bodies are in touch with each other and are interchanging information on many projects in process in their respective countries. Through these and other means considerable international uniformity has been brought about in a variety of specific subjects. Examples are mentioned below. Furthermore, a great deal of essential work has been accomplished in securing international uniformity in the use of fundamental units and methods of measurement which are a prerequisite to nearly all phases of industrial standardization.

International Electrotechnical Commission. The oldest and most experienced of the international bodies whose primary purpose is industrial standardization is the International Electrotechnical Commission, which was organized in 1906. The commission itself consists of a national committee in each of the 26 countries represented. These national committees are made up of accredited representatives of the various technical and industrial associations interested in standardization in the electrical industry. Nearly the whole of the work is done through advisory technical committees international in composition. Formal actions are taken at plenary sessions which are held at infrequent intervals. Agreements have been reached and published on a considerable number of electrical subjects, including such matters as definitions, symbols and general rules for acceptance tests. The most important part of the work is that dealing with the rating of electrical machinery and apparatus, that is to say, rules for determining what capacity may be claimed for apparatus and machinery as a basis of sale or tender. The war seriously interfered with the development of the commission's work. The question of a revision of some of the most important parts of the work on rating has recently been raised. The president of the commission is an American, Dr. C. O. Mailloux.

International Commission on Illumination. This commission, which was modeled somewhat after the lines of the International Electrotechnical Commission, was organized in 1913. Its work up to the present time has dealt with fundamental photometric definitions and quantities, hetereochromatic photometry, definitions and symbols, lighting in factories and schools, and automobile headlights. The president of this commission also is an American, Dr. Edward P. Hyde.

International Aircraft Standards Commission. This organization is also modeled somewhat after the International Electrotechnical Commission but the national committees are primarily governmental in character. The commission has developed from the co-operative efforts of the allied governments during the war in aircraft matters. There is no American national committee. At present, the commission is not active except as an agency through which the national committees exchange information on standardization matters relating to aircraft. The principal reason leading to this partial cessation of functions is due to the fact that the exact relation of the commission to the International Air Convention has not been clearly worked out. The Air Convention was an annex to the Versailles Treaty. The commission had under way work on a considerable number of problems. In these, dimensional standardization played a much larger role than has been the case with the International Electrotechnical Commission and the International Commission on Illumination. The work of these two latter bodies, as already indicated, has primarily to do with specifications, methods of tests and nomenclature.

International Chamber of Commerce. Considerable interest in industrial standardization has been taken by the International Chamber of Commerce. It has been decided that the Chamber will, however, not go into the field of technical standardization but will use its prestige and facilities to further the standardization movement and to promote the use of recognized standards and the actual understanding of such work on the part of nationals engaged in international trade.

> There are important considerations and powerful forces tending toward international standardization, such as the scientific basis which has been laid in the extensive system of physical and chemical units and measurements; the growth of international trade; the increasing use of specifications and other industrial standards in foreign commerce; the increasing interdependence of national industries; the increasing knowledge of international affairs; the greater tendency to study foreign industrial developments; and the fact that industrial leaders are taking a larger and larger perspective in planning for the future.

International Scientific Bodies. By far the most important of the international scientific bodies from the point of view of national standardization is the International Bureau of Weights and Measures. This is a governmental body and through it there has been accomplished a considerable amount of important legislation throughout the world, dealing with fundamental units and concrete standards of weights and measures. Important work on the temperature scale has also been accomplished by it. Specialized standardization work of important scientific fundamentals, such as standards of wave length, geodetic measurements, and the like, have been accomplished by international scientific bodies, such as those known as International Unions, now affiliated with the International Research Council. Probably even more has been accomplished by co-operation between the national standardizing laboratories.

All of the other national standardizing bodies have drawn heavily upon the experience and the methods of the British Engineering Standards Association. The British developed the method of co-operation which has come to be technically known as a "sectional committee." The actual formulation of specifications and other forms of industrial standards and the technical decisions involved are in the hands of such a sectional committee which is made up primarily of accredited representatives of the various bodies concerned with the standard in question. This general method, or some adaptation of it, has been adopted by all of the national standardizing bodies. The American Engineering Standards Committee had the advantage, during the period of organization, of having the counsel and advice of Mr. le Maistre, the Secretary of the British Engineering

Standards Association. Mr. le Maistre was in America twice during this period, the last time being upon the specific request from the Americans for such assistance.

Conference of Secretaries. In April, 1921, there was held in London a conference of Secretaries of national standardizing bodies. While this conference was wholly unofficial in character, it was the most important single step yet taken to bring about international co-operation in the broad field of industrial standardization. In addition to an extremely valuable interchange of experience, the conference resulted in an arrangement for the systematic interchange of information on the status of the various projects which each body has under way. This information is sent every three months to each of the bodies. The information is arranged uniformly and is written on uniform blanks, all by agreement between the offices of the various bodies.

This systematic interchange of information is limited to the indication, by means of numbers, of the stage of development which each project has reached. Minutes of meetings and drafts of standards are not included. The interchange of such information is subject to separate decision in each case, according to the policy of each national industry concerned. All approved standards are interchanged as a matter of routine. Another forward step was a reciprocal arrangement by which each body acts as a sales agent for the approved standards of the other bodies. Thus the standards of each country are always readily available to each of the others, not only to the working technical committees, but to industries of each country generally. The advantages of this co-operation are evident.

> It seems to me that the problems now confronting much of the national standardization movements are much the same as those that surrounded the movements toward trade associations in this country a few years ago, while international standardization will follow in much the same way, but without going so far or so rapidly.
>
> Whatever the ultimate outcome may be it seems to me that the next step in any case is the same—to develop as full and as free an interchange of information as conditions will permit.

It was the view of the Conference that international co-operation in industrial standardization work should proceed along such informal lines, being based primarily upon the interchange of information on active subjects of mutual interest rather than by any attempt at the present time to form a general international standardizing body; that in cases in which formal organization should be found necessary, the organization should preferably be by subject or industry, somewhat along the lines of the International Electrotechnical Commission; but that in all cases efforts should first be made to secure results by less formal methods; and to this end it would often be desirable that, in a given subject, the office of one of the national bodies most interested should, by informal agreement, perform such secretarial functions as would further international agreement in the particular subject.

This would result in some one of the following degrees of organization:

(a) Mere interchange of information and proposals by general correspondence.

(b) Informal subject centers, the office of one of the National bodies most interested performing, by informal agreement, such functions of a secretariat as may further international agreement in the particular subject.

(c) One or more conferences, without a permanent organization, where (b) should be found to be insufficient.

(d) A permanent international body.

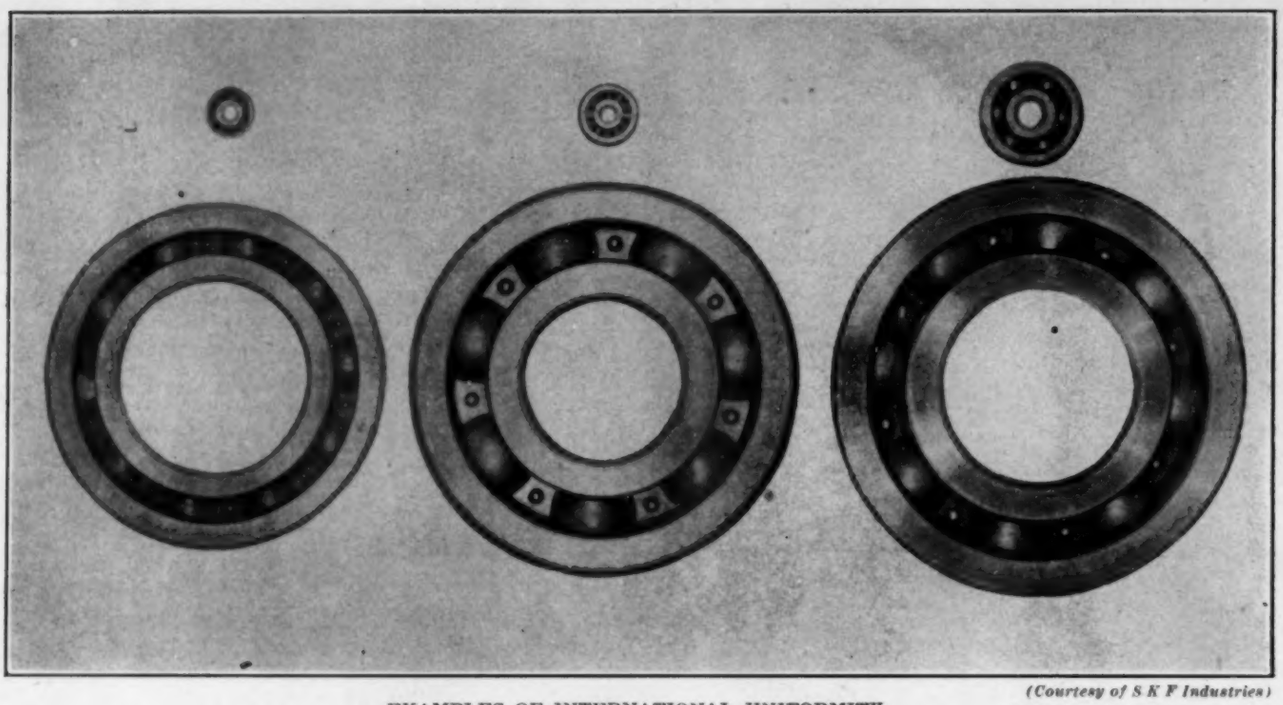
Generally speaking, standardization work in any given industry is apt to be taken up earliest in those countries to which the particular industry is of most importance. In this connection the interesting suggestion has been made by Dr. E. Adler that in bringing about standardization internationally, different countries might be formally recognized as leaders for specific pieces of work with which they are most concerned. While each would bear a special responsibility for those problems for which it would be serving as leader, it would have the co-operation of the other countries concerned thus making the arrangement somewhat like the sponsorship plan of the American Engineering Standards Committee.

It often happens that the same standard is used in two or three, or more, countries, without attaining such use in other industrial countries. This naturally results from commercial interchange, geographical position, the use of metric or English weights and measures linguistic, and other conditions. For example, the commercial and other relations between Belgium and France, Great Britain and her colonies, Germany and her neighbors, Austria, Switzerland, Holland and Sweden, and Canada and the United States have led to such results. The secretaries of the national bodies of Austria, Holland and Switzerland regularly attend group meetings of the German sectional committees.

In addition to the specific examples of international standardization work of the international bodies, which have already been referred to, mention should be made of some examples of projects on which co-operation between national bodies is now going forward.

Ball Bearings. Prior to the war a large measure of international uniformity in the subject of ball bearings had come about, without any formal organization but merely through ordinary commercial and engineering interchange. Of those forms of bearings which are more important industrially, at least 90 per cent are made to dimensions that are standard internationally. This refers mainly to width and inside and outside diameters of bearings, which provide interchangeability. The countries primarily concerned, and in the order of production, are: United States, Germany, Sweden and Great Britain. There has been a considerable interchange of information and suggestions and recently definite proposals were put forward by the American sectional committee, which is working under the joint sponsorship of the Society of Automotive Engineers and the American Society of Mechanical Engineers.

The most extensively used type of ball bearing is undoubtedly the radial bearing, the main purpose of which is to carry radial load. This bearing is built in three series, light, medium and heavy, the selection of series being dependent upon the load which the bearing of a



(Courtesy of S K F Industries)

EXAMPLES OF INTERNATIONAL UNIFORMITY

Six of fifty-nine ball bearings which are interchangeable internationally—the largest and smallest in the heavy, medium, and light series.

certain inside diameter has to carry. The illustration shows the three largest sizes of the above series, which are internationally standardized. The inside diameters are 110 m/m for the light series, 100 m/m for the medium series, and 85 m/m for the heavy series. It also shows the smallest bearings of the corresponding series, the inside diameter being 10 m/m for the light series, 10 m/m for the medium series, and 17 m/m for the heavy series.

The total number of internationally standardized sizes of these three series is 59, which covers practically all the commercial sizes of bearings which are in common use. Efforts are being made to agree on international standards for the extension of these series up to about 300 m/m bore, as well as for thrust bearings and the probabilities are that international standards will be set for all commercially used anti-friction bearings.

Gaging. Everywhere there seems to be a keen interest in national systems of limit gaging, doubtless due in large part to experience during the war in mass production of munitions, in which interchangeability of parts and supplies made by different manufacturers was a necessity. In this the continental work is more advanced than is the British and American work, which has not yet reached the stage of final formal adoption, the decisions being yet in the tentative stage.

On one important point, whether the shaft or the hole shall be the fundamental basis of reference, the American, British, Dutch, German, Swedish and Swiss work is in agreement. The decision is that the hole or, in the case of screw threads, the nut shall be the fundamental basis. The published Austrian standards appear to place the two methods upon an equal basis.

Among these, the continental countries and the American sectional committee (under the sponsorship of the American Society of Mechanical Engineers) have decided upon 20 deg. C. (68 deg. F.) as the standard temperature of reference. The British and Canadians use 62 deg. F. (16.7 deg. C.).

One of the most discussed questions is that of allowances and tolerances, and particularly whether the tolerance shall be stated as a plus or minus quantity or as a plus or a minus quantity. As a simple example consider a hole and shaft for each of which there is to be a tolerance of 0.002 in. to provide for variations in manufacture. Shall the hole be dimensioned at 1.001 in., $\pm$ 0.001 in. and the shaft as 0.999 in. $\pm$ 0.001 in., or shall the hole be dimensioned as 1.000 in. + 0.002 in. and the shaft as 1.000 in. — 0.002 in.? The first is often referred to as the "bi-lateral system," and the latter as the "unilateral system." The continental bodies have definitely, and the American sectional committee has tentatively, adopted the unilateral system. In Great Britain a very spirited discussion on the relative merits of the two systems has been going on for some time but I am not informed of any definite decision yet taken. It is interesting to note that the American sectional committee was organized as a result of a request for co-operation from the British.

Wrench Openings. Provisional agreement has been reached, informally, between most of the continental countries on the widths across flats on nuts and boltheads. The Swiss, who are serving informally as a secretariat according to the general scheme of co-operation sketched above, have made definite proposals for international agreement on a series of dimensions for wrench openings. The proposals include tolerances which are formulated with the intention of making it possible to bridge difficulties arising over the metric-inch question by making the tolerances such as to cover in practice the differences between metric and inch sizes. There are circumstances which make the time favorable for the consideration of the Swiss proposals. The Belgians are revising their work on bolts, and the British have organized work on the same subject and will revise their specifications for spanners. It is not unlikely that the British may reduce their nut and bolthead sizes, which are larger than those in other countries, in order

to make them more adaptable to the up-setting process of fabrication. The American work, which was organized as a result of the Swiss proposals, is just getting well under way.

Screw Threads. Work on screw threads has been active in recent years both in Europe and America. Few, if any, standardizing projects are as far reaching or as difficult. Changes of any kind are very hard to carry out even in the practice of an individual firm, to say nothing of the difficulties when considered internationally.

Whitworth threads are used very extensively in continental Europe, side by side with metric threads and on the whole more extensively. While I do not have authoritative information from all of the countries, I understand that at least the following have already adopted or are practically certain to adopt three series of threads for all but very specialized uses, namely: Austria, France, Germany, Holland, Italy, Sweden, and Switzerland. The three series are the International Metric thread, the Metric Fine thread and the Whitworth. Some of the countries have already definitely decided to abandon several less used metric series. It appears that in these countries the metric threads will be considered the primary standard and the inch threads as secondary, even though the inch threads are now in greater use. It has often been suggested that it is very desirable that the English-speaking countries list the International Metric and the Metric Fine threads as auxiliary standards, in order that, in those cases in which metric threads are used, the practice of the metric countries should be followed.

Agree on Thread

In this country the National Screw Thread Commission and the American sectional committee (the American Society of Mechanical Engineers and the Society of Automotive Engineers, sponsors) have now reached tentative agreement on the various details for the coarse and fine series of the American form of thread. The results have been transmitted to the British and Canadian associations. Whether some form of unification of the Whitworth and the American coarse series (practically the "U. S. Standard") should be carried out has often been discussed. Latterly, the opinion has frequently been expressed that discussions should not center, as formerly, upon the form of thread, since in the coarse fits the actual forms depart widely from the theoretical form. The pitches of the two series are identical with exception of the half-inch size, for which the Whitworth has twelve threads and the American thirteen per inch. Should the suggestion prove correct that the differences in form of thread may be ignored for loose fits and for all rougher work, a great part of the difficult problem would still remain unsolved. If the two series are to be unified, a great amount of study must be given to the questions, (a) What basis or bases of unification are possible and feasible? (b) Would the industrial advantages of unifying the two systems outweigh the cost and trouble of its achevement? In my opinion, far more extensive and explicit information than is now available will be necessary for the correct solution of these questions.

Information the Basis of Co-operation

Specifications for Zinc. The national bodies in countries concerned with the production of zinc and zinc ores are studying proposals put forward by the Belgians for international agreement on specifications for zinc and zinc ores. These are intended to clarify certain technical matters which affect the international market and about which misunderstandings arise. The American sectional committee was organized as a result of the Belgian request for co-operation.

From the very nature of industrial standardization it should be evident that there must be a full, mutual understanding and appreciation of the problems and point of view of the various parties at interest. This is true regardless of the scale upon which standardization in any particular project is carried out, whether by firms, by associations, nationally, or internationally. In any case there must be an interchange of information, the freer the interchange the better. It should occur as early as possible in the development of the work, in order that the necessary mutual understanding may be brought about. It is not enough to interchange information on completed work. Each country wants to have its standards become international standards.

Must Enlarge Views

If all the different countries wait until their work is completed before submitting it to the others, any one of them, by proposing its own standard for international adoption, places the others in the position of being asked to sign on the dotted line. Human nature is such that this does not work well. If information be exchanged during the development of the work, opportunity is given for each to understand and appreciate the other's point of view, and each is much less apt to become committed to policies and provisions which it would have been willing or even glad to have had different, had it had the advantage of such information during the development of its own work. Thus are agreements made easier and technical and industrial progress facilitated by the mere interchange of information.

For these reasons, the secretaries of the national standardizing bodies made the question of the interchange of information the principal consideration in their conference in London, as has already been indicated. I believe that the simple, systematic interchange of information on the status of projects there initiated will prove to have been a milestone in the industrial standardization movement, from the national as well as from the international point of view.

Publications of Value

Another very important development is the special publications, in journal form, of the national bodies in Austria, Germany, Italy and Sweden. In these, drafts of proposed standards, abstracts of minutes, etc., are given in much fuller form than such information is made generally available in Anglo-Saxon countries. The Germans consider that their "Mitteilungen" has been one of the prime factors in the extremely rapid development of their work. The information in these publications, while intended for their own industries, is, of course, available in other countries.

An A.E.S.C. European Representative. It has been suggested that the American Engineering Standards Committee could perform an extraordinarily important service to American industries by maintaining a representative in Europe. An engineer having the right combination of temperament, experience and linguistic ability would be able to supply an amount of information to our working committees on the standardization work going on in Europe and furnish a knowledge of

the industrial background upon which the standardization work is based that is quite impossible without direct personal contact. On the other hand, he could perform a like service in giving to the European bodies the American viewpoint and background. The benefits to American industries of the work of such a representative would be out of all proportion to the cost. Even the byproduct services which he would render should far exceed the entire cost.

In this connection it is instructive to note that Germany and Japan are the only two countries that have adopted a policy of studying technical and industrial progress in other countries systematically and intensively. There is no doubt that this policy has contributed in an important way to the meteoric development of the industries of Germany and of Japan.

What of the Future?

There are many and serious obstacles in the way of the development of international industrial standardization, such as differences in language, racial temperament, historical and industrial background, limitations imposed by geographical conditions, the metric and English systems of weights and measures, national animosities and rivalries, exigencies of commercial conditions, ignorance on the part of industrial leaders of the significance or even of the existence of foreign work, and the instinctive conservatism, not to say suspicion, of a large proportion of men toward new developments and ideas.

On the other hand, there are important considerations and powerful forces tending toward international standardization, such as the scientific basis which has been laid in the extensive system of physical and chemical units and measurements, much as an alphabet forms a basis for written language; the growth of international trade; the increasing use of specifications and other industrial standards in foreign commerce; the increasing interdependence of national industries upon each other; the increasing general interest in and knowledge of international affairs; the greater tendency to study foreign industrial developments and to adopt those which are applicable to home industries; the circumstance that specific industries are developing more and more along the same lines in different countries; and the fact that industrial leaders are taking a larger and larger perspective in planning for the future.

Standardization Near

The actual line of development must necessarily be the resultant of such conflicting tendencies and forces. In my opinion, a very considerable amount of international standardization will take place in the next few decades. This opinion is based largely upon evolutionary considerations. For example, it seems to me that the problems now confronting each of the national standardization movements are much the same as those that surrounded the movement toward trade associations in this country a few years ago, while international standardization will follow in much the same way but without going so far or so rapidly.

Whatever the ultimate outcome may be, and whatever one's estimate of the success of the movement toward international standardization may be, it seems to me the next step is in any case the same—to develop as full and as free an interchange of information as conditions will permit. Through some such procedure can standardization best be firmly established.

Experimental Production of Alloy Steels

By H. W. Gillet and E. L. Mack

Bulletin No. 199, of the Bureau of Mines, Department of the Interior, gives some of the results of the experimental heats of alloy steels recently made by the bureau for the Army and the Navy. The steels for the Army were desired for work on gun erosion, especially in regard to the effect of nitrogen on steel.

The use of a small direct-arc electric furnace for making small experimental heats of alloy steel is attended with difficulty in the control of the carbon content. Indirect-arc types, however, such as the Stassano, Rennerfelt, or the simple homemade furnace described allow a much better control of the carbon content. The raw material used must be sufficiently low in sulphur and phosphorus to obviate the making of refining slags, and straight melting, analogous to the crucible-steel practice, must be done. With these provisions, the making of special alloy steels in 50- to 100-lb. heats, to chemical specification, is relatively simple in a 50-kw. indirect-arc furnace.

Results Not Promising

This report deals only with the preparation of the various steels and with the recovery and the segregation of the different alloying elements. Some of the steels whose preparations are discussed in this section were of rather unusual composition, and many were nickel steels high in silicon, or steels higher in the various alloying elements than the common steel compositions.

As the composition of many of the steels is suitable only for special uses, no direct general conclusions can be drawn as to the value or lack of value of zirconium, titanium, uranium, boron and cerium as true alloying elements in the commonly used types of steels. In various physical tests of the steels covered by this report, steels in which these elements are present in appreciable percentages, the results so far obtained have not in general been promising. Nor have they been as good as those of similar steels of the series without these elements. Recent reports of tests of plain carbon steels of low carbon content to which less than 0.25 per cent of zirconium has been added are said to indicate that zirconium may have a beneficial effect, especially on notched-bar impact tests.

Used in Degasifying "Wild" Steel

Although these elements are readily oxidized, none of them appear to be as efficient as aluminum or vanadium in degasifying "wild" steel. No special study has been made of very small amounts of these elements used as scavengers only, but all of them seem likely to leave their oxides or other compounds trapped in the steel as inclusions when they are added immediately before pouring, as is necessary in order to get a good recovery when using them as alloying elements rather than as scavengers.

Boron is almost quantitatively recovered when added at the end of the heat and may be added at the start of the heat without great loss. In the amounts studied up to 0.6 per cent, no appreciable tendency to segregation was noted.

A complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price of fifteen cents.

Methods of Machine Tool Design

Continuation of the Section on Feed Mechanisms—Various Cam Arrangements for Screw Machines—The "Program" Machine and Its Future Possibilities

By A. L. DE LEEUW
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THE problem of keeping the size of a cam down to the lowest possible dimensions is a very important one, not only because large cams increase the size of the machine, and are apt to make it unsightly, but because they are also apt to decrease the strength and rigidity of the frame. The means employed to minimize the size of the cams are the following: Steep slope of the cam; return movements made by springs or weights; some of the functions actuated by springs or weights; some of the functions actuated by cams which revolve only when required and which revolve at a high speed, while the main cam may revolve at a lower speed.

The first method, that of using steep slopes for the cam, is very limited in its application. A steep slope is not advisable during feeding operations, although some instances have come to the writer's attention where a feed cam was used with an angle of 65 degrees. Of course, such an arrangement sets up excessive side strains, is very wasteful of power, and causes an uneven action on the tool. As a rule, cam slopes are held down to 45 deg. or less, even for return cams, whereas it is good policy to limit the slope of feed cams to 1 in 3. Attention should be called to the fact that not much can be gained in smooth action of the cam by making the slope less than 1 in 3. The smaller the angle of slope becomes, the less can be gained by making it still smaller.

Use of Springs or Weights

The second method of using springs or weights for return movements is safe when light members must be returned and when there is practically no danger of anything sticking. Where there is any danger at all that a tool may stick in the work or a slide may stick on its bearing, on account of the gumming up by cutting compounds or choking up by chips, this method is not safe.

The third method applies to such functions as feeding the stock in an automatic screw machine or doing any of the "productive" operations of some other automatic machines which call for a definite and limited amount of power only. A spring or weight can be applied in such cases.

The fourth method is the one referred to before and used in such machines as the Brown & Sharpe automatic screw machine where the shifting of belts, opening and closing of chucks and stock feed, are all accomplished by a cam which is clutch-operated and which makes a full or half revolution at a rapid rate after which it stops until it is tripped again. While such a cam is operating, the main cams of the machine keep on revolving at their relatively slow rate.

The peculiar construction of certain machines lend themselves to still other methods. An interesting way of reducing the size of some of the cams is employed in the Cleveland screw machine. In this machine two cams are used for the feed motion, one for the turret and another one for the cross-slides. The turret cam makes a full revolution for each movement of the turret. If there are five tool positions in the turret, then this cam will make the turret go forward and backward five times during the complete cycle. This cam causes the same stroke, whatever tool is used and whether the active stroke is long or short. Controlling mechanism at some other part of the machine causes this cam to revolve either fast or slow.

Variation of Speed

The actual feed stroke can be made as long or short as may be desired. If, for instance, there is a total stroke of 6 in., it will be possible to run the cam slowly for this entire 6 in. and return it fast to its starting position. Or the cam may advance fast for 4 in., then slow for 2 in., and then return fast the entire 6 in., or any other method of dividing up the total 6 in. Then, again, it would be possible to advance rapidly for 4 in. (or any other amount less than 6 in.), then feed slow for 2 in., and keep this slow movement for part of the return—let us say 1 in., after which it returns fast the remaining 5 in.

Not only is it possible to make any part of the forward or backward stroke fast or slow, but the slow movement can be given different rates of speed by a feed-changing device, so that on one stroke we may have a feed of 0.006 in. per revolution of the spindle and on another stroke—that is, for another tool—we may have a feed of 0.020 in. per revolution of the spindle. There is on this same machine, as was said before, a second cam which operates the cross-slide. This cam makes one revolution for a complete cycle of the machine, that is, the latter cam makes one revolution while the other cam makes five (supposing there are five holes in the turret).

Dividing Functions Among Several Cams

The cross-slide cam also has the fast and slow motion and it should be noted that both cams are running fast or slow at the same time because they are driven by the same mechanism. The cross-slide cam is not fixed but can be changed. Cam straps can be taken off and other straps put on to suit the requirements. It may very well be that the cross-slide cam requires a long movement or stroke at the same time the corresponding turret tool should get along with a short stroke. In that case, it is necessary to continue this slow movement, though the turret cam might have had a fast movement. This arrangement makes it possible to utilize a relatively small cam for the turret, but it does not obviate the necessity of using a large cam in the machine.

When the stroke required for various operations is long, the cam assumes very large proportions and that regardless of whether the stroke is used for feeding the tools or for any other purpose. It is therefore desirable to have some other method by which cams can be held down in size. If there were a cam for each operation and if this cam should be turning only when that particular operation takes place, it would be possible to keep these cams down to a very limited size.

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If it were found that some of the operations are short, then these operations might be combined in one single cam. Referring to the schedule of the screw machine with four tools which was discussed in a previous paragraph, we would do operations *a*, *b*, and *c* with one cam. After performing these operations the cam would stop, so that no space would be required for *d* (dwell of first tool and cross-slide tool). Another cam would then be set in operation for *d-1*, *d-2* and *d-3* (indexing and locking of turret), after which this cam would stop. A third cam would be used for *e*, *f* and *g*, whereas the second cam would be set in motion once more for *h-1*, *h-2* and *h-3*. A fourth cam would then perform operations *i*, *j* and *k*; after which the second cam would take care of *l-1*, *l-2* and *l-3*, and so on.

Distributing Operations over Several Cams

This leads to a great many cams and may be objectionable for that reason. If the feed motions do not require a long stroke, it would be perfectly feasible to have all the cam straps for *a*, *b* and *c*—*e*, *f*, and *g*—*i*, *j*, and *k*—*m*, *n*, and *o*, all on one drum, while the straps for *p*, *q* and *r*—and *t-1*, *t-2*, *t-3* and *t-4* could be on another drum. There would then be altogether three cams, one for the turret advance and feed motions, one for belt shifting, chuck opening and closing and stock feed, and one for turret indexing. In addition, there would be a similar cam for the cross-slide feed motions. All of these cams would be of relatively small size.

The difficulty we encounter with such an arrangement is this: that we must take good care that each cam operates at the proper moment and that there is no accumulation of error. There must be some controlling mechanism which will start and stop each cam at the proper moment and which will prevent them from getting out of time.

Such a controlling mechanism might be a disk which revolves once for a complete cycle of operations. Dogs mounted on this disk would operate clutches which would engage or disengage the various cams. Such a control mechanism would insure that each cam operates at the proper moment, but it would not insure the proper timing. To illustrate this, let us assume that there are two cams for different operations. We will call these cams *A* and *B* and assume that they are thrown into action by a positive clutch. When cam *A* has made one revolution (or as much of a revolution as may be necessary for a single stroke), the control mechanism throws out the clutch for this cam and, at the same time, throws in a clutch for cam *B*.

Controlling the Individual Cams

It may happen that the teeth of this clutch strike so that a part of a revolution of the clutch passes before cam *B* is engaged. To visualize the thing still better, let us assume that each of the two cams *A* and *B* occupies one-half of the total cycle and therefore one-half of the control disk. The striking of the clutch teeth has wasted, let us say, one degree of this movement, so that cam *B* will revolve through 179 deg. when the dog on the control disk throws it out of action. On the next cycle there may be a similar striking of the clutch teeth, again robbing cam *B* of one degree of its movement. It will be seen that whatever error there is in the engagement of the clutches is accumulated, so that in the course of time the cams must be in the wrong relation to one another. This method of control, then, which depends on a full cycle of the machine, cannot be used with this system.

To make such a system operative cam *A* should throw itself out after it has turned through the proper angle or the proper number of revolutions and it should throw in cam *B*. Cam *B*, in its turn, after making its proper number of revolutions, should throw itself out and throw cam *A* into action.

No Possibility of Accumulation of Errors

To show that such an arrangement would keep all functions in time, we will assume again the same conditions as before and see whether there is a possibility of an accumulation of error. Cam *A* completes a revolution, which corresponds to half the cycle, and throws its cam out which, of course, is a positive action happening at the exact place where the dog is set. It also throws into action cam *B* by means of a clutch. This clutch may fail to engage for a moment because the teeth strike. As a result there will be a period of idleness between the end of the action of cam *A* and the beginning of the action of cam *B*. But finally cam *B* will start its functioning, make a complete revolution, throw itself out, and start cam *A*. Whatever the delay may be in the throwing in of the clutches, such delay does not have any effect on the functioning of the two cams.

Combining Other Mechanisms With Cams

Some of the functions of an automatic machine may not be controlled by cams but by some other kind of mechanism. For instance, the indexing of a turret or other member may be effected by a Geneva motion which is revolved through one-fourth, or one-third, or any other fraction of a revolution. With the ordinary arrangement of cams, an idle space must be provided on all of these cams during the time that such operation takes place. If the operation was started by the throwing in of a clutch, the idle space on the cam must be made long enough so that any delay in the engagement of the clutches will not cause one of the cams to start its action before the proper time, for instance, after the indexing is completed. We see, then, that whether machine functions are controlled by cams, or by any other kind of mechanism, those cams which are actually used must be of a size sufficient for all the time occupied by such other mechanisms.

However, the final size of the cam may be made less by having some of the functions of the machine operated by a different kind of mechanism. If, in the previous example, the indexing was done by means of a part of the cam, then, in order to save time, it would be necessary to run the cam at high speed during that period and, as a consequence, a large portion of the circumference of the cam would be occupied for the period of indexing. If, on the other hand, the indexing was controlled by, say, a Geneva motion, we could throw this into action by a clutch on a shaft running at fairly high speed, meanwhile running the cam at a low speed so that, during the short time required for the indexing, only a very small part of the main cam would have passed a given point. Arranging things this way, however, is not always safe. Should the clutch refuse to engage for a considerable length of time, the index might take place after the cam has started some other function of the machine and this might lead to serious trouble. In short, then, if we wish to operate various functions of the machine by cams and other mechanisms not positively connected, we should arrange matters so that each previous element throws itself out at the end of its functioning, at the

same time throwing the next element into action. This system lends itself very well to highly complicated machines, has the advantage of using small cams, and simplifies the setting up and the analysis preparatory to the changing of a job.

Taking, again, the example of the automatic screw machine with four turret positions, we might make one cam for all the advances, feeds, and returns of the turret. We could do this in two ways: either make the cam sufficient for a single stroke only, or else make it so that one-fourth of the cam is used per stroke.

Applying Separate Cams to a Screw Machine

In the first case, we would have an arrangement resembling very much the turret feed cam of the Cleveland screw machine, but in this example the cross-slide cams might also be made small. It would be possible here to have a long cross-slide operation combined with a short turret movement. We may assume that the turret cam has started and after the turret is on its way a dog on this turret cam throws the cross-slide cam into operation. This cross-slide cam may go as fast or slow as may be required. It will keep on running for a complete revolution when it will throw itself out.

In other words, after it has once started it has no further relation with the turret cam. At the end of the stroke of the turret cam—that is, after this cam has made one full revolution—the index mechanism is thrown in, and at its completion the turret cam is thrown in, this time by the indexing mechanism. This will be repeated three times, but at the end of the fourth time, the index mechanism does not throw into action the turret cam but some other cam used for opening and closing the chuck and feeding the stock.

All that would be necessary to accomplish this would be to have a disk upon which dogs are mounted and which makes one full turn for four index movements. The first three dogs would have acted directly on the turret cam mechanism, whereas the fourth dog acts on the stock feed cam. When this latter cam has made one full revolution, it throws itself out and may throw into action the turret cam, this starting again a complete cycle.

The Other Arrangement of Cams

If our machine had been a chucking machine instead of a screw machine, the stock feed cam would have been omitted and the fourth dog on the index mechanism would have thrown this mechanism out of action without starting the turret cam, thus stopping the machine. If such a chucking machine were provided with a collet chuck or any other kind of chuck which can be operated by a single movement, we might have had a cam for this operation and we would start the cycle by starting that cam. It will be seen that this arrangement of successive cam operations is much more elastic than the common arrangement by which the time of all the various operations is laid out on the circumference of one single cam.

If the second scheme had been followed—that is, if we had put the feed cam for the four turret positions on one drum—we would have had the following sequence of trips. The first part of the feed cam advances and returns the turret and then throws itself out of action and starts the index. The index having been completed, its mechanism throws itself out and starts the feed cam again, which makes another quarter turn, repeating the operation until, at the end of the fourth indexing operation, the machine either stops itself or the index mechanism acts upon a cam for chucking, etc. The four parts of the feed cam may be equal or unequal. If equal, the dogs for tripping the index mechanism may be stationary. If not equal, they must be adjustable so as to place them always in the proper relation to the end of the cam groove. The manner in which the index mechanism may cause a tripping of the feed cam for the first three movements and of some other cam at the end of the fourth movement may be accomplished by having a disk on which dogs are mounted and which turns once during the four complete operations of the indexing mechanism. The fourth dog would be different from the other three and would operate in a different plane.

A Glimpse of the Future of Automatic Machines

It is, perhaps, not out of place here to enlarge somewhat on the possibilities of such a system of control of automatic functions of machine elements; to look into the future, so to speak, and describe a style of machine which is not yet in existence but which would have certain definite advantages and lend itself to automatic machining operations on pieces which are not made in sufficiently large quantities to justify the setting up and camming of the present style of automatic machines.

I would call this style a "program machine." Such a machine might have a turret with tools, cross-slides, milling attachments, drilling spindles, or any other kind of tool or work carrying elements. The functioning of the machine might include the chucking of stock, the operation of magazines, the feeding of bar stock, the shifting of belts or gears, the throwing in of clutches, the indexing of a turret, the starting of a stream of lubricant—in short, any operation which is now done by any of the existing automatic machines.

Each element to be moved would have its mechanism which goes through a predetermined cycle and then stops itself. Such a mechanism might be a cam or an indexing mechanism, or a one-revolution clutch, or it might even be a screw which makes a certain number of turns forward and then reverses; but all of them would have this much in common: that they would go through a certain cycle of operations and then throw themselves out of action. The differences between such a system and the system of camming described in the previous paragraphs would be this, that in this system an element throws itself out at the end of its cycle but does not throw into action any other element. This throwing into action might be done either by hand or by another mechanism which may or may not be supplied with such a machine.

The "Program" Mechanism

In case the elements must be started by hand, the auxiliary mechanism, which we will call the "program," might consist of an endless chain which is advanced one link every time a cycle comes to an end. The movement of this chain would bring a letter or set of instructions before the operator, bringing it under a window so as to make it visible. There would be a number of starting levers or buttons or knobs which take the place of such elements as are ordinarily acted upon by the dogs of an automatic machine. These levers or knobs would be plainly marked with a letter. At the end of a cycle, then, we will say that the letter *D* appears, which tells the operator that he must move the lever or knob marked with that letter *D*. At the end of the next cycle the letter *A* appears. At the end of this cycle the letter *C*, etc. The chain would have as many links as there are

operations to be performed. With a four-hole turret, of which all holes are provided with tools, the letter *A* would appear four times (if *A* stands for starting the turret), and the letter *C* also four times (if *C* stands for starting the index). If, on the other hand, this four-hole turret were provided with two tools only (that is to say, if two holes were idle), we would get the following: *A, C, A, C, C, C,* and then *A* again. Instead of having single letters appear, it might be possible to have written instructions appear, telling the operator not only which letter to start next, but also whether he should measure or do other things which may be required.

Making the Program Machine Automatic

This machine might be provided with a number of small pneumatic cylinders and the links of the chain might be provided with pins which would operate the valves for these cylinders. Such an arrangement would make the machine entirely automatic. By leaving the pin out of the last link of the chain, the machine could be made to stop at the end of the completed cycle. Almost endless variations to this arrangement could be devised. Instead of a chain, a perforated roll of paper might be used, very much like the music rolls for a player piano. The author, in the June, 1920, issue of *Industrial Management*, expressed his belief that such a style of machine is needed and will ultimately be brought out.

The exact form which such a machine would take cannot be predicted. It would replace a group of machines. It would have the advantage over such a group that a mere change of the letters or instructions on the chain would have the same effect as a complete re-grouping of the machine. Suppose there were a group of six simple machines, of which three can be operated by one man. The next job might need only five of these six machines and would require an entirely different grouping. It is, of course, out of the question to change machines around for every job, so that, with a number of machines grouped in a permanent way, we will have almost always an unsatisfactory arrangement; perhaps one or two idle machines and loss of time in many other ways. The program machine would overcome these disadvantages completely.

This Lily Needs No Painting

By Charles W. Lee

There are few lines of industry in which greater care is required than in the manufacture of machinery. There is no easy, hurry-up path to success and the buyer will always be found critical of any product for which he pays his good money. The following episode, which is founded on fact, will illustrate this point as well as any which has ever come to our notice.

A certain maker of machinery, who holds the mistaken opinion that the way to succeed in the machinery business is to "get 'em done, get 'em out and get the money for 'em," was sent the following letter which speaks for itself:

"Your machines were duly received and dismantled for inspection. But we find it impossible to re-assemble them in proper alignment because we can find no newspapers in our city that are of the same thickness as your local newspaper. Please send us three or four copies of the latter."

Machine Shop Bulls—I

By Joe V. Romig

To make a bull means, in the parlance of the machine shop, to spoil a job, and this sad and awful experience comes to every machinist occasionally, and to some more often.

A familiar saying of the machine shop is, "The guy that never spoils a job, never makes any right." Although this saying does not offer an excuse for a bull, it contains a bit of truth, nevertheless.

One of two things usually happens when a bull is made. Either it is covered up or repaired, or it is found out with the resulting dismissal of the bull maker or his being retained with a reprimand. It depends pretty much on the foreman.

Once, two hoboes, brothers, so they said they were, applied to the shop foreman for positions as machinists. They had rolled into the mill's railroad siding on a coal train and they surely looked like two regular hard boiled guys. Machinists were scarce at the time, and they were taken on.

Sam was shunted to the outside repair gang, while Tom was put to work on a small lathe in the machine shop. Tom's first job was a small eccentric, a repair job for one of the mill's small hoisting engines. A drawing was given him by the foreman, showing plainly all the dimensions, and specifically calling for the bore to be ½ in. off center.

The Literal Word

When he finished the job he took it to the boss and asked what was next on his program sheet. One look at the roughly finished job was enough for "Reds," our foreman, as he saw the centrally bored eccentric hole.

"Ye gods, man!" he shrieked, "How much throw did you give this job?"

"Throw, what do you mean?" replied Tom, the hobo machinist.

"You're fired, get out of my sight!" screamed old "Reds," as he turned away in disgust.

In the meantime, Sam was also having his own troubles. His instructions had been to tear out a section of leaky water pipe, and he followed them literally, not taking the time to shut off the source of water.

Although the pipe leaked badly while he was sawing out the section, he kept on until the section blew out and drenched him in the outflow, much to the amusement of the rest of the gang.

The brothers met together at the pay clerk's window, after which they left by the same route in which they had come, namely *a la* bumper.

"Quid Pro Quo"

By R. Grimshaw

This proverbial expression, signifying "something for an equivalent" should apply in all business relations, for no transaction will be permanently profitable unless satisfactory to both parties concerned. In particular application to industry it means "a fair day's work for a fair day's pay" neither element being considered more important than the other, and neither side to the bargain or transaction to make mental reservations or to break contract in letter or in spirit. The foreman can see to it that this motto is enforced as against both management and workers.

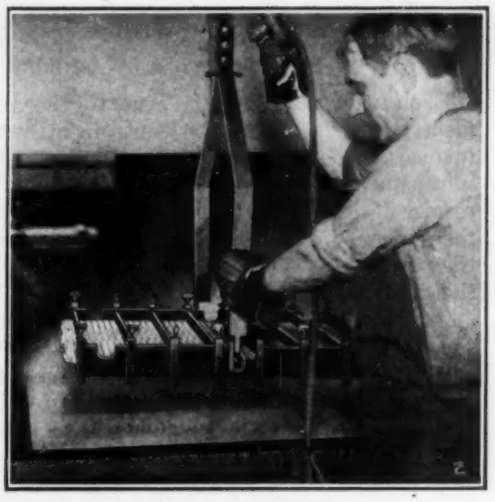


FIG. 1—ASSEMBLING THE STRIPS IN FRAME. FIG. 2—SOLDERING THE STRIPS TOGETHER

Forming the Franklin Grille

MOST PEOPLE like to have things that appear conventional rather than otherwise, even to their automobiles. So, in order to resemble the effect of the honeycomb radiator, the Franklin engineers designed a grille for the front of the hood which appears conventional and yet serves its purpose of admitting air freely while protecting the motor as in other cars.

This grille is made up from sinuous strips of sheet metal, formed by passing them between corrugating rolls. The strips are then laid in rows between points in a suitable frame as shown in Fig. 1 with the points so spaced as to bring the tops of the curves together and leave a series of openings between the strips. When the frame is filled and the strips clamped in place, it passes to the next operation where it is dipped in acid and then into molten solder, as in Fig. 2. The solder unites the strips into a solid grille so that it can then be handled as one piece.

The grille is then taken to a band saw where the outside is trimmed according to a templet clamped to it. This operation is shown in Fig. 3. A round hole is also sawed at *A* where the grille fits over the starting-crank end of the crankshaft. The grille is then mounted in a suitable frame or case in the same way as the core of a radiator in a water-cooled car. It has no need for water connections, however, and so is much simpler and lighter than the regular radiator.

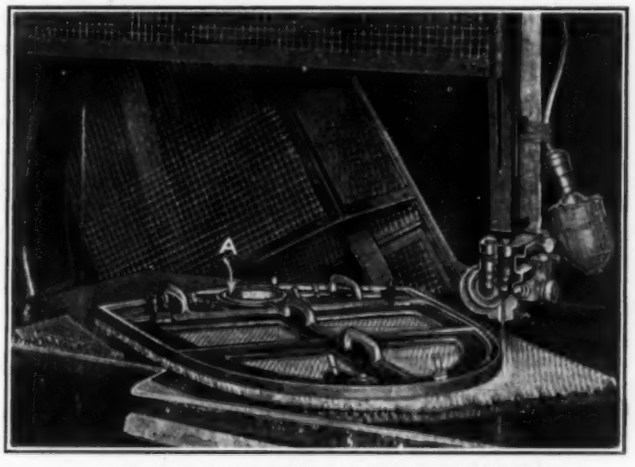


FIG. 3—SAWING THE GRILLE TO SHAPE

The Disease Called Drafting

BY ENTROPY

Out of every graduating class from every engineering school there is sure to be a small number of young men who do not immediately find the jobs they would like. A very few of these men go back to the school and teach, the rest get jobs as draftsmen. They make themselves think by so doing that they are entering on a state, humble to be sure, of engineering. What they find out, unless they recover their wits soon, is that they have tied one end of a rope around their necks the other end of which is tied to a large and husky mill stone.

There is no very logical reason for this condition. It is simply a fact that managers, as a rule, are not looking toward their drafting rooms for material from which to select executives. Cause and effect work here very much like a dog chasing its tail. The fact that the drafting room is not regarded as the place to find executives makes men who have strong ambitions fight shy of going into them at all. Consequently, the drafting jobs do not attract the best type of men in any considerable numbers. As a result of that the work turned out in drafting rooms is not so well thought out as it should be. It is much criticized, and being criticized is made still less attractive to men who aim to be successful, and consequently the drafting room becomes the graveyard of hopes for both old and young.

This is just mere shortsightedness all along the line, and can be cured by attacking the problem anywhere in the circle it describes. The most natural and easiest place to begin the reform would be for the management to look over its drafting force each time it wanted to make a promotion, and if possible to take enough men from that source to give the rest of the men encouragement to try for higher jobs. Once the circle is broken there will be better men using the drafting room as a stepping stone for promotion, better drawings and better co-operation between engineering and production departments.

Circulating the Trade Magazines

BY DOROTHY A. WASHBURN

Each new magazine is sent to the record department, which contains the centralized files for letters, invoices, orders, catalogs, etc., and the library. The librarian in charge receives the magazine and makes a record of it. A card in duplicate is typed, headed by the name of the magazine, and listing the names of the persons to whom it is to be sent, with a column for the date, similar to Fig. 1.

At the head of the column is written the date of the magazine and after each name is written the date that person is to return it to the record department. The cards are then filed in two separate divisions. One file gives the date the magazine is to be returned, and the other the reader to whom it is sent.

A printed form similar to Fig. 2 is pasted on the front of the magazine. In the date column is stamped the date the magazine is to be returned, and it is then sent on its way.

As a rule the length of time allowed to read each copy is about three days. If anyone wishes the copy again, and requests its return, it is sent back for a longer period after others have read it.

The person receiving the magazine knows he is to return it by the date stamped. He signs his name in the column headed "Name" on the slip, so that when

AMERICAN MACHINIST				
	Nov. 10		Nov. 10	
J. Jones	11/14	M. Close		
J. White		W. Lewis		
G. Brown		H. Hughes		
D. Smith				
L. Wood				
M. Douglas				
R. Post				
K. Clark				

FIG. 1. MAGAZINE RECORD CARD

a magazine is returned to the record department the librarian knows that the person for whom the magazine was intended, actually received it.

After the cards (Fig. 1) are made out and the slips pasted on the magazine, the file to subscribers is glanced through, and it can easily be seen who has magazines and who has not. The new magazine is then sent to the person on the list for that magazine who has no reading material. This is true also of the magazines which have been out and are being returned. The two cards representing that magazine are taken from the files, a line drawn through the last date written after a reader's name, the reader's file looked over, the magazine redated and sent on to someone who has no magazine.

If the tickler file shows a magazine has not been returned on the date it was due, the day following a typed request is sent out, similar to that shown below:

Date.....

Mr.....

Please return the following overdue magazines.

.....

Thank You,

RECORD DEPT.

When the cards show a date after every name on the list, the circulation of that magazine is then complete as far as the list is concerned. A line is drawn through the column on each card to show it is no longer in use.

For the final disposition, the most important of the magazines are bound yearly or semi-yearly, and as complete indices come with them, any article may be very easily looked up. The rest of the magazines are disposed of in various ways. All are kept on file for one year, after which time, they are sent to the various departments, to take out the articles most interesting to them.

In comparing this method with others, the biggest advantage seems to be the quick and complete circulation of the magazines to so many people. The magazines do not go uniformly to the same people in the same routine each week or month, but instead each one has a fair chance to receive the new copies. This keeps the interest of all the people, for everyone is anxious to receive the new copies, and it proves an incentive to them to get right down to the magazine they have and read and return it promptly. It prevents one man having several copies lying around on his desk for a week or so, and then being a long time without any. This method also enables anyone in the plant to receive each copy of any magazine he desires. He merely sends his name in for the librarian to put on the list.

PLEASE RETURN TO RECORD DEPARTMENT. BY.....	
Date	Name

FIG. 2—SLIP PASTED ON MAGAZINES

By a method mentioned in the *American Machinist*, Vol. 53, page 803, only certain persons who may be interested in particular articles were the ones to whom the magazine was sent. It seems to me it would be rather difficult to determine just what articles might interest each particular person, but when a person receives a magazine he can easily tell which articles he wishes to digest thoroughly, and which are of no value to him.

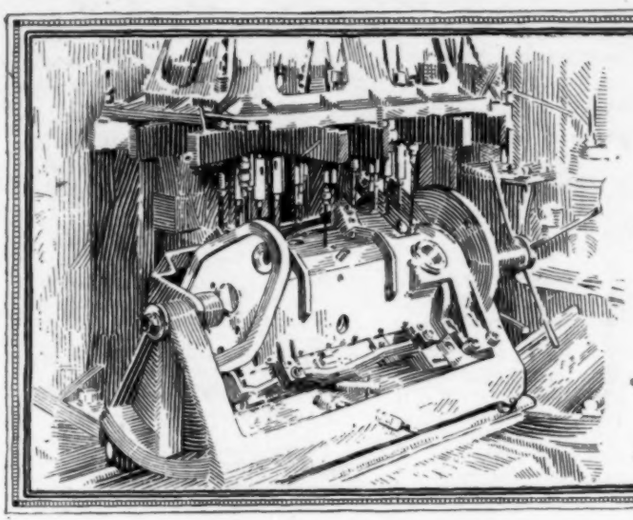
This plan has proved very successful for the past two years in circulating four weekly and nine monthly magazines, a total of twenty-five per month. Because of the long lists, each magazine travels to quite a number of people but as it is returned to the librarian each time there is no difficulty in locating it or any other magazine which anyone may wish to look up. Inasmuch, as this plan gives shop employees and officials an equal chance to receive each copy, to receive new copies at the earliest possible date, to have reading material at all times, and as it also enables us to circulate the magazines quickly, and finally to keep them in ways by which they are easily accessible, we feel that we are certainly using the trade magazines to capacity

Chink-in Work

BY C. E. JENSON

"Chink-in work" is that which is taken on special contract or put in hand on the manufacturer's own initiative, to fill in time that otherwise might have to be paid for—with the alternative of having to close down, run on short time, or lay off hands.

Every manufactory should have a list of chink-in work that it could make, with a memorandum of the best probable markets for the output.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Details of Blanking Dies Continued—Plain and Automatic Stock Stops—Types of Mechanical Feeding Devices—Examples of Modern Die Design

IN FEEDING sheet stock through a die for a blanking operation it is necessary to provide an accurate stop so that the work will be produced with uniformity, and the waste of material will be as small as possible. On certain classes of work a positive stop is not always used, as the workman's eyesight may be utilized, and very good results obtained in this manner. In the example shown at *A* in Fig. 462 a die of this kind is illustrated. A sight hole *B* is placed in the stripper plate *C* in such a way that the workman can look down through the hole and see the edge of the work, thus obtaining the correct location for each successive blanking operation. The appearance when looking through the hole is indicated by the small detail shown at *D*. There are some shops that use this method almost exclusively, but the majority prefer something more positive and less subject to errors on the part of the workman.

Must Be Handy

In designing a stop for a given piece of work, it is well to remember that it must be so arranged that the operator can find it readily. He must depend upon his sense of touch when doing this, but care must be taken to make the stop in such a way that it will be as little trouble as possible. When the punch recedes from the work it pulls the stock up with it until it strikes the stripper plate, at which time the workman, by using a little pressure on the stock in a longitudinal direction, can slide it along to the stop just at the moment when the punch leaves the stock so that it is free to move.

A very simple form of stop is shown in the example *E*. It is a round pin *F* placed in the die as shown, so that after one blank has been cut out, the edge of the stock will come against the pin in such a position that the right amount of stock will be left between blanks. The enlarged detail at *G* brings out a point of importance in connection with the placing of stock stops. The pin *F* is too close to the opening in the die and a fracture might be caused if it were placed as shown. The distance *H* should always be less than that at *K*, so that stock can be moved freely over the head of the pin when feeding.

In order to prevent the placing of the stop pin too close to the edge of the die opening, a form like that shown at *L* is frequently used. Here the pin *M* has an extension end on it as indicated, so that the hole *N* can be placed a sufficient distance away from the die opening. Usually pins of this kind are made solid; but it is possible to use a design similar to that shown at *O*, in which the stem and extension are separate pieces fastened to each other in some approved manner. In general the solid type is to be preferred, as there is no likelihood of separation.

It is not always necessary to place the stock stop in the die itself. It can be positioned in the stripper plate, as shown in the example *P*, if this seems advisable. In this example the die is cut away at *Q*, so that the stock can be tipped to pass by the stop pin *R* which is set in the stripper plate. An arrangement of this kind may sometimes be found an advantage. Several other methods can be used when the stock stop is placed in the stripper plate. In the example *S* the stop *T* is pivoted, so that when in the correct position the small end lies down against the face of the die. The work *U* is passed through the die and pulled back against the stop to determine the right position. It can be seen that the stock will readily pass by the stop when feeding, but that any movement in the opposite direction is restricted by the stop falling down and striking the face of the die.

Automatic Stops

Another stop of very similar form is shown at *V*. In this case a coil spring is placed at *W* in order to make sure that the stop will be forced down and strike the face of the die. The action of the stock on the stop as it passes through the die is clearly shown in the example at *X*. Another form of stop is shown at *Y*, in which the spring used is of somewhat different kind and acts on the pin to which the stop is fastened. The type of stop selected is dependent to some extent upon the work which is being blanked and to the designer's own preference.

Stops which are automatic in their action to all intents and purposes can be applied to many kinds of blanking operations. An example of a stop of this kind is shown in Fig. 463. The diagram at *A* shows the stop

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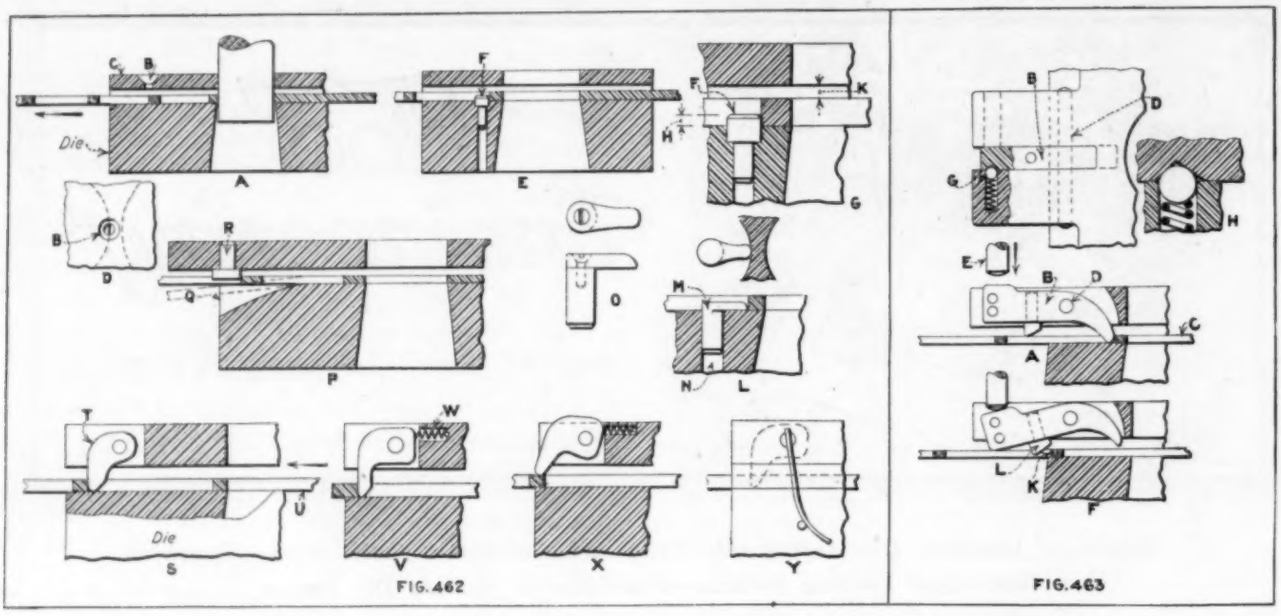


FIG. 462—EXAMPLES OF STOCK STOPS. FIG. 463—AUTOMATICALLY OPERATED STOP

B in position against the stock *C*, which is being fed through the press. This stop is pivoted at *D* on the stripper plate, and it is actuated by means of the pin *E* in the punch holder. As the punch comes down, the pin *E* presses down upon the end of the stop and causes it to take the position shown at *F*. Referring to the plan view it will be noted that there is a ball detent *G*, which snaps into a depression in the side of the stop after it has been pushed down by the pin *E*. An enlarged detail of the ball detent is shown at *H*.

The stop remains in the position shown at *F* until the punch has raised itself from the work, at which time the operator pushes the stock along so that the portion *K* strikes the pin *L* and causes the stop to assume the original position shown at *A*. When so located, a continuation of the feeding movement by the operator brings the stock firmly against the stop. The action of the press simply releases the stop, throws it out of the way and puts it into a position such that the forward movement of the stock in feeding automatically drops the stop and brings it down again to the locating position.

Punch presses can be fitted with standard stops when so specified. An arrangement of this kind consists of a pointed finger which is adjustable for various sizes of blanks. The finger can be so adjusted that at the proper time it drops into the hole punched at the preceding stroke, thus forming a positive and accurate stop.

Automatic Feeds

Mechanically operated feeds for punch presses may be grouped roughly into two distinct classes; *viz.*, first-operation work feeds, which are used on the rough stock before anything else has been done to it; and, second, other feeds which are applied to blanks or forms which have already been put through one or more punch press operations.

Considering first the feeds applied to first operation work, we have the following:

Roller Feeds, Single or Double. This kind of mechanically operated feed is applied to flat bars or sheets held between rollers by spring pressure. The feed is actuated intermittently by the action of the press.

Push Feeds. In this kind of power feed the work is held by stationary gripping fingers while the punching operation is going on. Between the strokes of the press the stationary fingers release the work, and sliding gripping fingers take hold of it and move it along longitudinally a pre-determined distance, after which the stationary fingers grip the work once more and hold it firmly while the sliding fingers return to their original position.

Reel Feeds. This type of feed is designed to handle flexible material in strips from a reel. The reel is arranged so that it has a brake on it, and the stock is

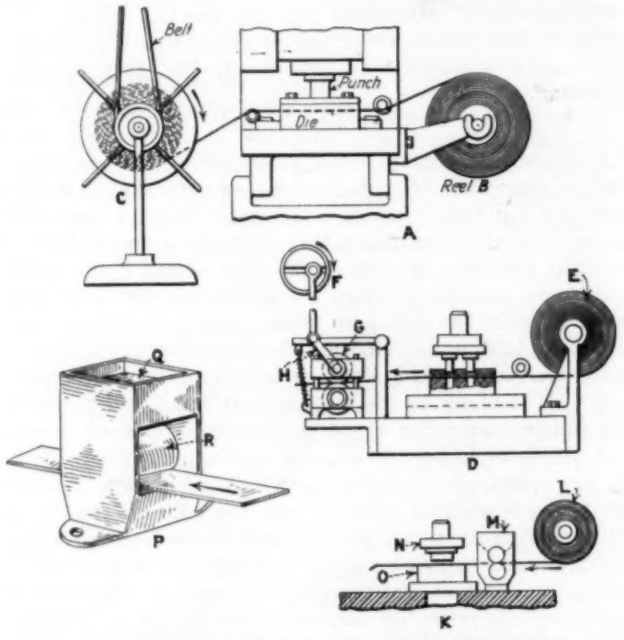


FIG. 464—APPLICATIONS OF AUTOMATIC FEED

pulled through the dies and wound on another reel operating intermittently between the strokes of the press.

Gravity Feeds. When the axis of the press ram is set at an angle to the vertical, so that the material

slides down the incline by gravity against a let-off gage placed at the rear of the dies and worked automatically, the feed is termed gravity feed.

The feeds in the second group are used only on work which has previously been stamped, blanked, or otherwise shaped on the punch press.

Dial Feeds. Feeds of this kind are used for forming,

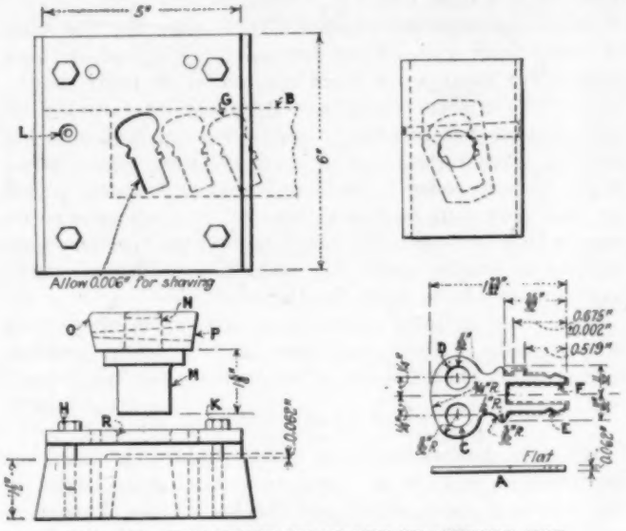


FIG. 465—EXAMPLE OF PLAIN BLANKING DIE AND PUNCH FOR KEY

coiling, redrawing or repunching work. This type of device consists of a disk or dial which rotates intermittently, and which has a series of equally spaced openings or pockets in which the work is placed by hand. The dial revolves so that the pieces are successively located directly under the punch, and yet the operator's fingers are in such a position while loading that there is no danger from the punch.

Friction Disk Feeds. This arrangement is such that the articles are pushed from a table on to a revolving disk, by means of which they are carried by friction between guides or plates and thus delivered to the dies. Each piece is stopped by a let-off device which limits its movement as it is carried in to the final position.

Conveyor Feeds. Occasionally the lower die is so arranged that it conveys the work by swinging or sliding so that it comes into correct position under the upper die. This arrangement is termed a conveyor feed.

Carriage Feeds. This type of feed is of the reciprocating order. A carriage comes forward and receives the work, after which it returns between the dies and then repeats this operation for each piece handled.

Hopper or Tube Feeds. This type of feed is also occasionally termed magazine feed. It is used for small articles such as medals, coins, washers, locknuts, trade-checks and other work produced in large quantities. The parts are piled one on top of the other in a tube or magazine, and allowed to descend by gravity into a dial conveyor or carrier. Applications of this form of feed can be made in certain kinds of high production work to great advantage.

In order to illustrate more clearly the application of automatic feed to certain kinds of work, several diagrams are shown in Fig. 464. In the example *A* the stock is fed from a reel *B* through the dies, as shown, and to another reel *C* on which it is wound up. An arrangement is provided so that there is friction on the reel *B*, and the reel *C* operates intermittently at each stroke of the press.

Another method which is used for stock which comes on a reel is shown at *D*. Here the reel *E* carries the stock, which is fed through the dies in the direction of the arrow. The method of feeding is by means of the eccentric *F*, which operates the rolls *G* through which the stock is drawn. A pawl attached to the arm *H* moves the feed roll forward at each upward stroke of the press. The applications of ratchet feed have been mentioned previously.

Certain kinds of stock require oiling before passing through the punch, and the designer should bear this point in mind and provide an oiler of some sort so as to take care of the situation. An example of this kind is shown at *K*, in which the stock is fed from a roll *L* through an oiler *M* and between the punch and die at *N* and *A*. A simple type of oiling device is shown in the enlarged view at *P*. An oil chamber *Q* is open at the bottom so that it discharges on to a felt roll *R*. The construction of this device is naturally governed by the lubrication required and the quality and kind of material which is in process.

Examples of Blanking Dies

We have endeavored to familiarize the designer with the various points of importance in connection with the design of blanking dies. We have taken up all of the points of importance in detail, and we shall show only two examples of blanking dies in order to apply some of the principles which have been set forth in the article. Fig. 465 shows an example of a plain blanking die and punch for the key *A*. The drawing of the key is double size, in order that the dimensions may be more clearly apparent. It is made of 0.062-in. stock; the operations necessary on it are, first, blank, second, pierce, and, third, shave portions indicated by the dotted line.

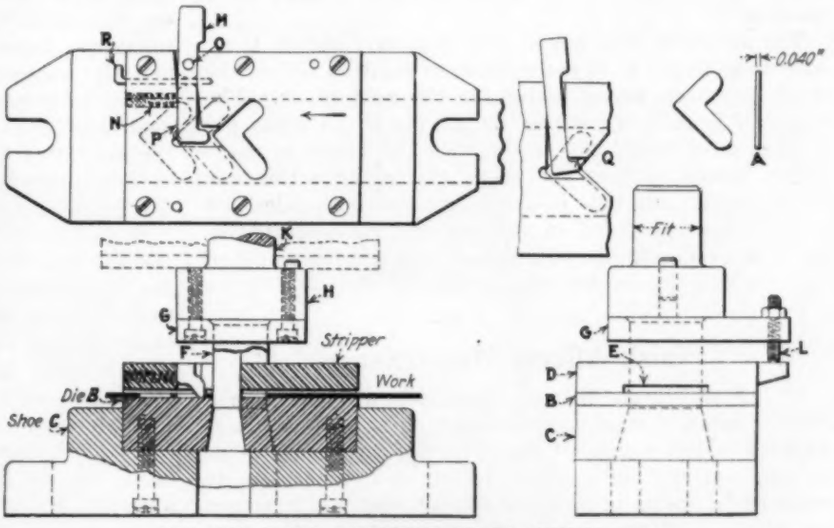


FIG. 466—GOOD EXAMPLE OF BLANKING DIE

It will be noted that in blanking, as shown in the layout *B*, the holes *C* and *D*, notches *E* and slot *F* are not produced. The holes and notches are afterwards pierced

and shaved. The blank layout is at a slight angle, in order to produce an economical run of stock. In the illustration the die is shown complete with the stripper plate, having a guide on one side only as indicated at *G*. The other side is open, but support for the plate is obtained by the two screws at *H* and *K*. The stripper plate is cut out where the punch enters, so that there is a slight radius on it as shown at *R*.

A sight hole is provided at *L*, so that the workman can adjust the stock properly for the first two blanks, after which the finger gage on the machine can be set for the regular run. The punch *M* has a round shank *N* which fits the punch holder *O*. The punch is held in place and located by a taper pin *P*. This is a very good example of a simple and efficient blanking die in which a number of the principles previously mentioned are applied.

Another example of a blanking die is shown in Fig. 466 for the part at *A*. The stock in this blank is 0.040 in. thick and the blank itself is of irregular shape, as indicated. The die *B* is fitted to the shoe *C* and located by means of screws and dowels. The stripper plate *D* is of one-piece construction, being relieved at *E* to receive the work. The punch *F* is made to the shape of the part and has no flange or shoulder, but is fitted into the punch plate G and peened over to prevent it from pulling out. The punch plate is held on the punch holduer *H*, which has a shank *K* that is fitted to the press.

The finger stop shown in this die is somewhat different from those previously indicated. The punch plate *G* contains a screw *L*, which strikes the finger stop *M* on the downward stroke of the press. This raises the finger out of the work opening which has previously been cut by the punch, and the finger is forced toward the die opening by means of the spring *N*. The finger is then constrained to move down on to the stock again by the action of the spring *O*, and instead of going into the opening it strikes on the stock surrounding it. There is still pressure exerted on the stop, however, so that when the work is moved in the direction of the arrow the finger drops into the opening which has just been produced. As the stock is moved forward, the finger strikes against the portion of the stripper indicated at *P*.

The action of this finger stop is clearly shown at *Q*, where the finger is in the downward position before the stock has been moved along for the next blank. The finger *M* is held in position by the pin *R*. A taper pin is used as a pivot, and the hole in the finger is made large enough so that the required rocking action can be obtained. The hole is countersunk on both sides and a ⅛-in. land provided in the center. In general, this die and punch may be considered as a good example of modern practice in designing blanking dies.

Finish Affects Maintenance

It is very rarely that an operative will not give a highly finished machine more care than one which is painted or left rough. Usually he will have more pride in the matter; but even if he has not, as neglect to wipe down shows promptly and may result in reproach or reprimand, the necessity for going over every part with waste to keep everything clean, enables detection of minor troubles that should be attended to, but that otherwise might go unobserved. The finish is a sort of long-life insurance.

The Passing of Craftsmanship

By Entropy

It is the fashion to deplore the passing of any old custom. The failure of modern mechanics to have the painstaking interest in their work which is seen in that of the men of a century ago is no exception to the rule. Is it a total loss?

These old time workmen did their jobs for the sake of doing them well. They derived a great deal of their reward for their work from the praise of their neighbors. The writer remembers an uncle who worked at odd minutes for months to make the smallest possible pair of blacksmith's tongs, forging them like a large pair. He succeeded in making one that was only about an inch long, but he would not sell it. All he wanted was to be able to exhibit it. If he had known of anyone making a smaller pair, his would have lost all value and he would have tried for the record.

Now very little of this spirit is seen in shops. It still prevails in sport, but sport and the shop come no nearer today than the use of horse shoes for "pitching."

Old Spirit Gone

What is happening, and quite rapidly, is that the draftsman, designer or engineer is setting up limits in the drafting room which are checked in the inspection department. The workman gets comparatively little credit for keeping within narrower limits than have been set for him. He is no longer able to take any of his work home to show the neighbors, and unlike the village smithy, the shop is not open to everyone that happens along to watch the workmanship of the craftsmen. Within the limits set for him all that is asked of the modern workman is production in as great quantities as possible.

After all, this is merely a shifting of the rules of the game. The product of the shop under the regime of limits and tolerances is as good as the nature of the work demands, as good as the public will pay for. Anything better does not add greatly to the customer's satisfaction nor to his well being. Extreme nicety of workmanship remains what it has always been, something to be exhibited, but the audience cannot get in to see the exhibition. It may be that these limits and tolerances have been made under pressure of the war and the succeeding madness too easy of attainment, and it may be that we shall see a tightening up of quality of workmanship, but that is rather doubtful in the machinist trade.

If it were cabinet making or furniture, which is sold for its beauty and apparent excellence of manufacture it would be different, but almost all machinery is extremely materialistic. There is very little opportunity for a mechanical device to appeal to the eye or ear through its beauty. In fact most mechanisms are today being housed in and so covered up that the engine of a high grade motor car looks like a block of solid cast iron. Its valve levers and even spark plugs are housed in under a cover or hood of its own. Mechanism is concealed as something essential but not to be admired nor too often inquired into by the uninitiated. There is a very good reason for this precaution for many an automobile driver is cursed with dangerously little knowledge of machinery and at the same time an appetite for tinkering which is likely to be appeased at the expense of the parts easiest to get at. For safety's sake fine workmanship must forego admiration.

Combination Piercing, Blanking and Forming Dies

Construction and Operation of Two Dies Which Replaced Four—Safety Features Taken Care of—Wearing Parts Easily Replaced and Adjusted

By C. J. DORER
Chief Engineer, White Sewing Machine Co.

IT IS OFTEN a puzzling task to combine piercing, blanking and forming operations to get the most out of a single die and thereby cut down the number of operations. The particular case which I am about to cite is one which was formerly done in four operations, and is now done in two. The cost of the two dies as now used, and hereinafter described, is slightly less than that of the other four. Also, the operating time was cut to fifty per cent of the previous operating time.

The piercing and blanking die is run at the rate of 112 strokes per min., the operator getting 67 blanks. The forming die is run at the rate of 42 strokes per min., the operator getting 42 blanks. In order to obtain such results, care must be taken to get all parts requiring the operator's touch into plain sight and easy reach. This fact is often lost sight of in the attempt to cut the original cost of the die. These dies were designed with the idea of being practical labor-saving devices and have proved to be so.

Varied Design

In the design, use was made of a number of schemes, such as a bushed stripper plate, disappearing pilots, spring and push fingers, a sectional bushed pillar die, kickers and spring pads. Such things are always of value to a designer of dies, even though the case may not be as complex as this one.

The piece described has two compound bends and is made of 0.060-in. stock, the smallest piercing punch being 0.078 in. in diameter. It will be noted upon examination of the blank that the corners where the double vertical bend takes place have been undercut so as to prevent the stock from tearing at this point.

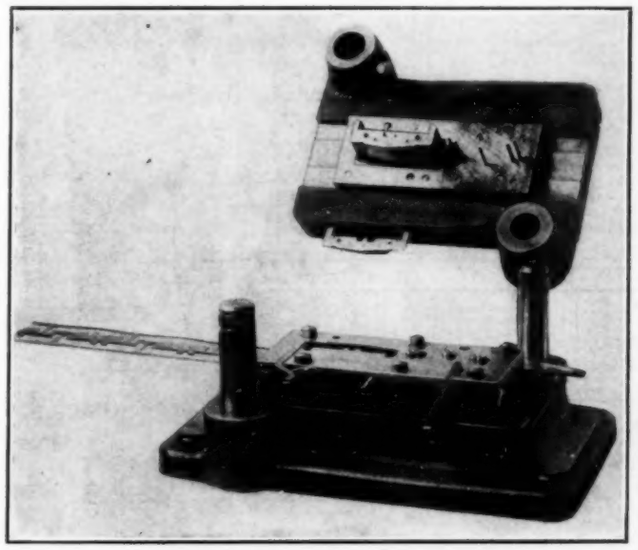
The blank and formed piece, also a section of the strip, are shown in the photographs of Figs. 1 and 2. It was necessary to hold the blank and pierced holes correct to 0.001 in. The pierced holes had a limit of 0.001 in., which meant that they could not increase in size as the die wore. In order to get the greatest amount of blanks out of the least amount of stock, the blanks were interlaced in the strip, as shown in Fig. 1. Owing to the staggering and interlacing of the blanks, the strip had to be started at a different point when going through the blanking die the second time.

Layout of the Blanking Die

The piercing and blanking die was laid out and built as a pillar die in order to maintain accuracy and cut the setting up time to the lowest possible point. It will be noted that the two pillars *A* and *B*, Fig. 3, are of different sizes to prevent accidental reversing of the die. They are placed across the corners to get as great a center distance as possible.

The die block was split in two pieces—C_1 and C_2. The split was placed between the piercing holes and material left for grinding, so that in case the blocks warped in hardening they could be ground and the center distance between holes maintained. The two blocks were set flush and screwed and doweled in the shoe in the customary manner. The same held true for the punch pad, parts D_1 and D_2, which was divided between the piercing holes and the blanking punch.

The stripper *E* was screwed and doweled to the die and the holes through which the piercing punches passed bushed with hardened tool steel bushings. The stripper was made in one piece and left soft so as to insure absolute alignment with the holes in the die.



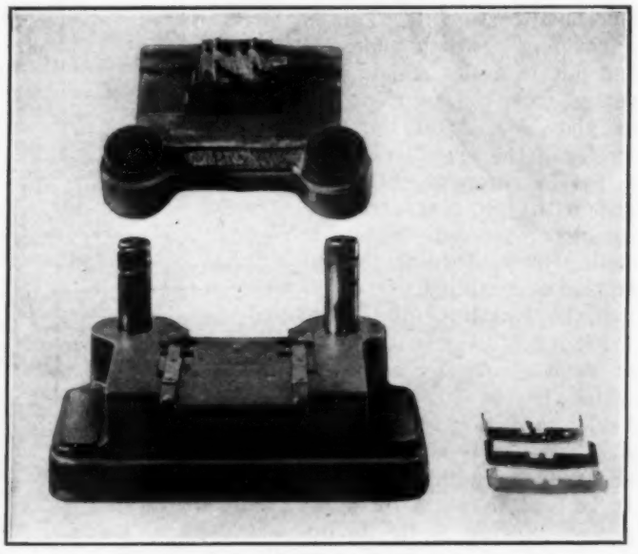


FIG. 1—BLANKING AND PIERCING PILLAR DIES. FIG. 2—FORMING DIE AND WORK

Owing to the closeness of the holes it was necessary to flatten the bushings F_1 and F_2 on one side, and press them in together. The punches G_1 and G_2 have a slightly enlarged shank to stiffen them as much as possible and to prevent the cutting edge from striking the bushings. The shanks are a sliding fit in the bushings. This was done to prevent the punches from walking on the stock, which is the ruination of any die.

Removing the stripper from a die is often troublesome, especially if it is a complicated one and parts of it are attached to parts of the shoe or die block. This difficulty was overcome in this case by building the stripper as a separate unit. It will be noted upon examination of the drawing that the stripper, back gage and other parts will lift off as one unit by removing the six cap screws and leave the die flush and even for grinding. By using cap screws for this purpose the stripper can be removed while the die is set up in the press.

Bushings H_1 and H_2 (see drawings) were placed in the die block in order to hold the holes to size. These can readily be replaced by removing the stripper, turning over the die and pushing them out from the bottom.

The blanking punch J was made in one piece and set in the left half of the punch pad in the customary manner by riveting over. The two pilots K_1 and K_2 are disappearing pilots backed up by springs, and are shown in section Y-Y. In case of a mispunch, or other accident, these pilots will push up and not set up a bad strain in the whole die. Such pilots are easily placed in any die by simply counterboring the punch and punch holder as shown.

The stock is fed in, as usual, from the right up to push finger L, which is normally held out by a spring. This is a flat finger which slides in and out in a slot and is prevented from coming clear out by plate M. After the first stroke of the press, the stock is fed to automatic finger N and with the next stroke a complete pierced blank is made. From then on the operation is continuous throughout the length of the strip.

Finger N is pressed down at each stroke by screw P, which is set in the punch holder, and is pivoted on pin R. The pin is easily put in and removed with the fingers. It is held in place by a set screw. Spring S, by its upwards and sidewards action, lifts the finger and lands it on the fin, permitting the stock to slide over for the next blank.

Owing to the interlacing of blanks, a third finger I was necessary when starting the stock through the second time. This finger had to enter the opening left by the first blank after the first run. A push finger could not be used, as it would strike the outer fin left by the blank, so a pivoted finger was used. It is pivoted the same as finger N, the operating end being held up by spring U. When using this finger the operator pushes it up, thus engaging the stock. To understand the necessity for this construction, one must study the blank and strip shown in Fig. 1.

In a die which is built low and compact as this one is, it is always advisable to have fingers which extend out from the die. Any design which tends to cause the operator to place his fingers under the punch holder should be avoided. It is apt to result in the loss of a finger or part of a hand. Too much emphasis cannot

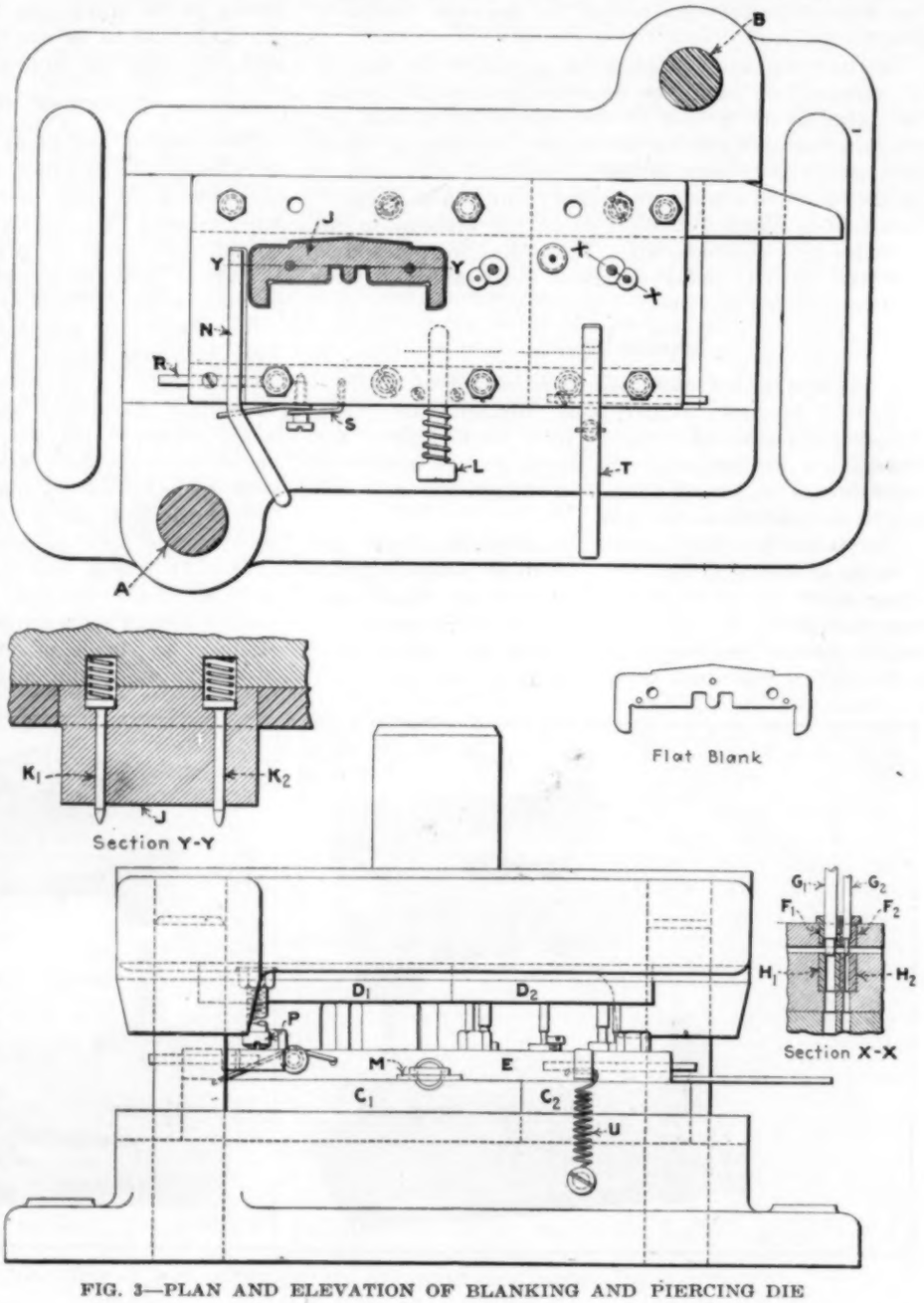


FIG. 3—PLAN AND ELEVATION OF BLANKING AND PIERCING DIE

be placed upon the fact that to make a die like this a paying proposition the wearing parts and points which must be held to size must be readily and cheaply replaceable. In this die round bushings pressed in are all that are necessary.

The forming die is also a pillar die and is sectional the same as the blanking die, in order to make wearing parts easily replaceable. It is built with a chute for feeding in the blanks and the gages are so placed that the formed blanks slide by and fall out the back. One blank is formed complete at each stroke of the press and two blanks are in the process of forming at one time. Figure 2 shows three blanks: one ready for forming, one partly formed, and one completely formed.

The blanks are laid upon plate *A*, Fig. 4, between guides *B* and are pushed forward by the operator, the plate being long enough to hold three or four blanks. The first blank, at the start, is just pushed over the edge of spring pad *C* and as the punch comes down it is formed and then pushed forward by the blank behind, which takes its place. Gages *D* then function as the stop and temporary locating medium. As the punch comes down, the sides and front point of the blank are whipped up. The sides are now away from gages *D*, and as the blanks are pushed forward the completely formed blank passes through and drops out of the die. Pilots are used for accurately locating the blank. The die goes to bottom so as to set the first form, which is made on die blocks *E*. The pad *C*, however, does not go to bottom.

The punch *G* is built of a solid piece of tool steel with four pilots *H*, two for each blank and four kickers *J*, two for each blank. The kickers are used for pushing the blanks off of the punch pilots.

Upon examination of the first form, it will be seen that the points of the blank are bent up and at an angle of 5 deg. This meant that these points could not lie upon the pressure pad *C*, but were obliged to extend out over it and be formed. This was accomplished by inserting the properly contoured block *E* on each side. The blank was engaged first by the central projection on the punch *G* and held square by the pressure pad *C* and accurately located by pilots *H*.

In the first form the points of the blank are bent down, and this meant that they would engage the blocks *K* and prevent being pushed through. In order to overcome this, kickers *L* were placed in these blocks, which raise the points up to their previous level and allow the partly formed blank to slide over. These kickers also serve to prevent the blank from being tipped over when the punch comes down, as the block is struck by the punch before it is gripped.

The pressure pad *C* had to be cut out so as to fill all the forming condition and have strong equally balanced springs. It is held from coming out by two filister head screws. The die is built up out of eight pieces, five of which have forming surfaces and are easily replaceable. Filister head screws set in from the outside are all that are necessary to hold them in place as the pressure in most cases is outward.

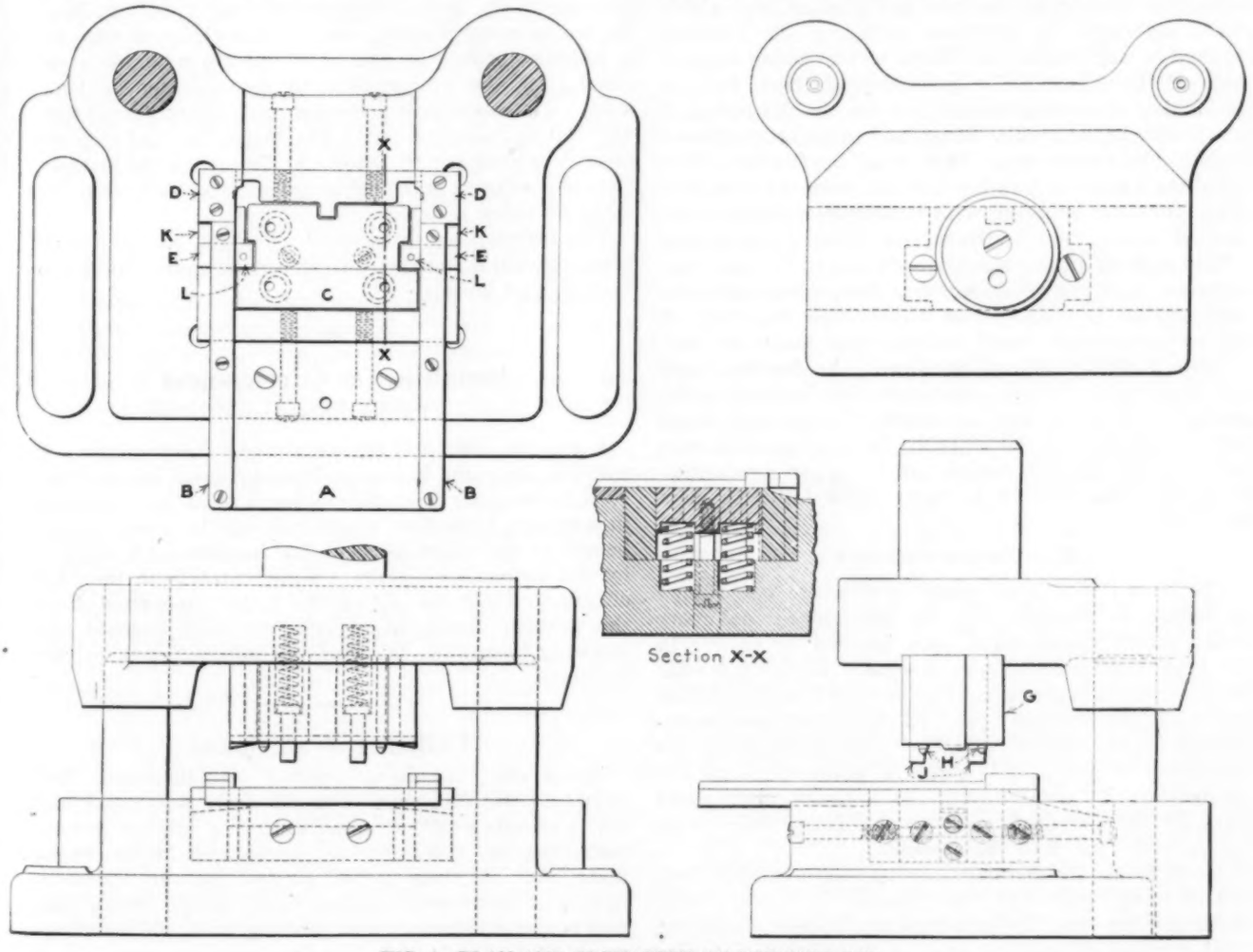


FIG. 4—PLAN AND ELEVATION OF FORMING DIE

The Foreman– Past and Future

By G. G. Weaver

On every side we hear of the need for greater production, the decrease in labor trouble, the reduction of costs, and upon investigation we find that the foreman is charged more or less with bringing about these necessary and timely conditions. The foreman, on the other hand, is positive that every person about the place indulges in that favorite indoor sport known as "passing the buck," which results in making him the "goat." The situation is worthy of a rather detailed consideration.

In the first place let us analyze the foreman's position so that we may have a fuller appreciation of his duties and obligations. The foreman occupies the same place in industry as the keystone occupies in an arched bridge. On one side are the workers and on the other side, the management, both demanding loyalty and co-operation. To the men he represents management and, as far as the men are concerned, his talk and his actions are management. To the management, he is the agent through which all the orders, desires and policies of the management are communicated to the working force. In other words, he is the medium or keystone through which the management functions.

Epoch-Making Period

We are now passing through an epoch-making period in modern commercial life, an era unparalleled for industrial and economic changes. These conditions are responsible in a large measure to the great war which was a nightmare to everyone, including the foremen engaged in war industries. There was a sudden demand made of the foremen for greater production, for the installation of new equipment and for the designing of new tools. Innumerable things had to be accomplished to meet the emergency. This great confusion, which tested the human endurance, was placed on the shoulders of the foremen, bringing with it strange difficulties, industrial unrest, new controversies, labor disturbances.

This state of affairs was no doubt due to the fact that untrained and inefficient workers discovered unlimited opportunities in position and wages, with the whole of the manufacturing world bidding for their services. In spite of the chaos and handicaps, the foremen were held responsible by the employers for increasing the production, meeting high standards of cost, and securing co-operation of the working forces, in addition to their regular routine duties. It is no strange coincidence that the foremen in many cases failed to meet the issue.

Must Study Foremen

The World War made employers realize two things in regard to foremen. In the first place too many duties which should have been handled by others in the organization have been delegated to the foremen. In other words, management, in the rush of affairs, failed to analyze the foremen's job. In the second place, management must devote more time and attention to the training of foremen, if it hopes to secure efficiency and harmony in its organization. As a result, many firms have re-arranged or re-assigned the duties which were formerly delegated to the foremen.

Many firms, the country over, are interested in giving training courses to their foremen to better enable them to cope with the problems which they encounter. Such courses of training are not designed or intended to improve the mechanical or technical skill of the foreman, but rather to teach them a better understanding of their position regarding the human factors which enter into their jobs.

Foremen who have taken such courses of training say that they have acquired a different idea of their job and of their relation to their men, and that these courses have given them the means to receive and give better co-operation throughout their organization as a whole. The foremen may be one of two things to his employer, either an asset or a liability.

The foreman who is an asset will: (1) Exercise a most human attitude to the employees without being weak; (2) be willing to assist the employees with their jobs and to instruct them; (3) be loyal to the management by properly representing them to the men; (4) give constant and exact supervision to the work as to quantity and quality; (5) display a willingness to co-operate with other foremen and other departments; (6) give assistance to the time study department in setting rates that are fair to the men and fair to the company; (7) make a constant effort to keep down the overhead expense; (8) prevent material and human waste; (9) be always eager to improve his ability by showing an interest in trade journals, lectures pertaining to civics, politics, modern methods of handling men, etc.

The foreman who is a liability will: (1) Fail to properly supervise his work; (2) use hasty judgment in handling his men; (3) lack interest in the men or a human quality in his relations to them; (4) criticize the management without complete knowledge of what he is talking about; (5) fail to co-operate with his associates; (6) be antagonistic to rate setting or time study; (7) misrepresent management to the employees; (8) fail to co-operate with the inspection and employment departments; (9) show indifference to the instruction of workers, and neglect to acquire leadership instead of being a driver.

The foreman has performed a big job and has overcome colossal difficulties. However, he cannot afford to rest on past laurels.

Penalties for Carelessness

By R. Grimshaw

I am out and out for penalizing carelessness. A man has no right to expose himself, much less his fellows, to danger. Therefore, when I see a man smoking in a garage I think he should not only be fined, for the benefit of his fellow workers, but handled a bit roughly by his associates. I am inclined to believe that his efforts to enlist the aid of the police (recruited from the working classes and themselves daily exposed and exposing themselves to danger) would be comparatively fruitless.

Utilizing Wall Space

There are few manufacturing establishments that utilize to the full, even if at all, their wall space and yet it affords excellent opportunity for affixing shelves, racks, piping, transmission, cranes and hoists, maps, plans, etc. By their use we succeed not only in economizing or supplementing floor space, but in saving time and wages otherwise spent in going after things which might just as well be before the nose.

Investigation of Steels for Gages

The Bureau of Standards program for the laboratory investigation of gage steels is as follows:

The chief properties desired in gage steels seem to be (1) resistance to wear, (2) minimum dimensional changes on hardening, (3) freedom from dimensional changes with time, and (4) machinability. To properly outline a program of experiments seeking to obtain these independent properties in the highest degree, it is essential to analyze each separately and determine the important factors contributing to it. Because the existing knowledge of many of these factors is very limited, only a preliminary analysis of the problem of determining their function is possible now.

With the progress of experiments on the fundamental factors involved, it should become clear what precautions are necessary and what the crucial experiments to be performed are, thus eliminating inconclusive and negative data in the principal series.

Amsler Abrasion Test

Resistance to wear generally accompanies hardness, a property necessary in gages to prevent distortion on handling. On this account, wear need only be considered in steels of the martensitic class, or those not far removed from it. Resistance to wear, however, is higher in harder steels than in soft ones and there is still a wide range of values possible for any given hardness. The ultimate criterion of this property is, of course, the length of service under uniform conditions, although this is impracticable for any extensive investigation. It is usually inconsistent unless a large number of specimens are used because of the difficulty of securing uniformity in its execution. Moreover, it is highly desirable to obtain a quick wear test.

For this purpose the Amsler abrasion test machine has been decided upon. This machine produces dry wear on the periphery of two disks by means of a combination of rolling and sliding friction. The test pair may be identical or one a standard and the other the test piece. The latter is often the best method as the true value of a good block would probably not be indicated when tested against itself. It is also desirable to use a hard standard to get faster action, but this does not reproduce service conditions as closely as a soft standard. The two methods must be compared.

Comparison of Results

After the technique of this test is worked out, it will be necessary to compare its results with those from service tests on identical metal. While there may be no close relation found between the two, the quick test should at least show steels worthy of a service test.

The preliminary work planned for the machine, to test its reliability, consists of running two carbon steels. SAE 1020 and 1090 respectively, hardened by Pratt & Whitney Company, and oil hardened "Ketos" steel. These disks will be tested against themselves and against hard and soft standards, both as hardened and as tempered. It is expected that data secured will show the possibilities of this test for further work.

When the above test proves satisfactory, the effect of other alloys of variations in constitution should be studied. Of particular interest is the effect of chromium and tungsten, individually, and also of austenite in the structure. Hadfield's austenitic manganese steel is very resistant to wear, and, although too soft for the present purpose, it is possible that conditions intermediate between martensite and austenite may afford a good combination of hardness and wear resistance. Such a combination offers a possibility of reducing internal stress, as will be noted later.

Dimensional Changes on Hardening

Changes in dimensions on hardening are caused by at least two independent factors, (1) thermal stresses and (2) the volume change of the transformation of austenite to martensite. The thermal stresses are inherent in any quenching operation and cannot be avoided. The undesirable feature of the distortion produced by them is its non-uniformity. We know that it can only be uniform in a symmetrically cooled body such as a sphere, unless elaborate precautions are taken. The stresses can, of course, be practically eliminated by using a steel of so slow a critical cooling rate that it will harden all the way through on cooling in air. Unfortunately, however, there is available no satisfactory commercial steel of this type having good machinability. It is essential therefore to consider means for avoiding thermal stress distortion in appropriate oil-hardening steels.

To study thermal stress distortion it is necessary to eliminate other factors contributing to dimensional changes. Of these the volume change of martensite formations is most important. For this purpose a steel austenitic and stable, at ordinary temperatures, is required. The principal sources of stress, temperature gradients on heating and on quenching, must also be studied independently.

Quenching Power of Baths

The quenching experiments will require a knowledge of the quenching power of the baths used. This information makes possible also another important determination, the critical quenching rate of the steels used. It is desirable to use as slow a cooling rate as will give penetration of hardening to the center. On the other hand, it is essential to use a treatment which completely hardens. This introduces another variable which affects the dimensions profoundly and is very difficult to control.

The other important source of dimensional changes is the volume increase of austenite transforming to martensite. While the volume change is constant for any steel and treatment, it is not possible to say whether or not the dimensional changes due to it vary between different points in the same specimen. It is quite possible that they do, as the transformation must progress through the soft metal when the thermal gradients demand, thereby producing stress between the transformed and the untransformed metal. The untransformed metal, austenite, is soft and readily deformed plastically, and distortion may easily occur. To investigate the source of distortion, the quenching stress effects must be eliminated, as is possible by using a steel austenitic at ordinary temperatures, but convertible to martensite above the temperature of liquid air. These experiments should be carried out on specimens of at least two ratios of length, for example, to diameter 4:1 and 1:1.

If this condition proves to be a serious source of distortion, methods of avoiding it must be studied. Two possibilities are evident; either the temperature of the quenching bath may be raised and the specimens slowly cooled in the bath, thereby reducing the stress between

the martensite and austenite; or alloy additions may be made which decrease the intensity of the volume change.

The changes in gages on ageing are quite irregular. Some steadily increase in length and others decrease, while some change erratically. sudden changes in length and planeness are assumed to be due to stress effects while the uniform changes are very likely the result of slow changes in the constitution. Hardened steel is known to temper slightly at ordinary temperatures and this appears to be the constitutional change producing the dimensional changes. Martensitic steels decrease in length on moderate tempering and semi-austenite steels increase. It is quite probable, therefore, that the presence of a small amount of austenite in the matrix is responsible for the increase in length of gages. The magnitude of these factors should be determined by length and time measurement, starting as soon after hardening as possible, on blocks hardened to give maximum and minimum stress and definite ratios of martensite to austenite.

Omit Tempering

The ageing changes continue over a period of months, even years, so it is desirable, as far as possible, to shorten the length of time required to give definite results. This can be accomplished and the total effect magnified by omitting tempering. It appears safe to assume that a block which has good ageing properties untempered will have better qualities as tempered. It is essential to study the effect of tempering but the choice of tempering temperatures will depend more on wear tests than on ageing.

It is almost impossible to eliminate all time changes by the above method. It is important, therefore, to investigate artificial ageing, the usual method, of which, is both a temperature cycle and a stress cycle. The latter may be expected to develop any weakness in the block, but probably has little effect in establishing constitutional equilibruim. On the other hand, if the benefit is conferred by the temperature cycle alone, there appears to be no reason why it should be repeated. It may be possible to simplify and render more effective the ageing treatment by studying independently the thermal and stress cycles.

Machineability

This important property is not determined in the routine manner because of the difficulty of producing uniform tools and of determining the end point of the test. Since, however, the life of a tool depends largely on the temperature it acquires in cutting, the temperature developed in a tool under standard conditions appears to offer a reliable criterion of the machinability of the steel cut. It would be necessary to run the tests at speeds which would not dull the tool rapidly but this is not objectionable, most of the machine work on gages being in the nature of finishing. Such a test has the desirable feature of being simple, quick, and positive.

By investigating the four essential properties of gage steels, in the manner outlined here, it should be possible to determine the relative merits of the collection of commercial steels available, as regards each property. With this information available, it should be possible to develop compositions giving better combinations of the properties than any yet found and to select, at the same time, from the tested steels, the one which has the best combination of properties for a set purpose.

New Industries and New Tools

By Entropy

No one buys machine tools except for the sake of the profit which it is expected they will earn. Not many firms throw out old machine tools to substitute new ones. The cost of installation plus the low prices usually obtainable for the old machines make anyone stop, look and listen before doing anything of the kind.

But it is not very often that a new concern, just starting up, fits out with second-hand machinery. That is just the one time when they usually have plenty of money, and they buy their equipment before they discover how much capital is tied up in product in process of manufacture. Relief of the machine-tool situation then depends, not on any general improvement of existing business, but on the development of new businesses.

New business depends on invention or discovery. The automobile business was the salvation of the machine-tool industry while it was developing. To be sure, the automobile shops robbed the machine-tool factories of their best mechanics, but they also gave these shops the trade that kept them from the rocks.

Is there any hope for some fad that will call for the formation of new mechanical industries? If there is, and no matter what it is, it will inevitably react on the machine-tool situation. Is there to be some development of radio work that will make great demands on light machine shops, and help the bench-lathe and milling- and drilling-machine people? Is there to be development of airplane manufacture that will call on shops of the same class as the automobile shops?

Depends on Forethought

Is there to be some new mechanical musical instrument? Whatever it may be, we can rest assured that it will be something mechanical. Today everything that is material at all has become a matter of machinery. Our tables groan under the weight of books, papers and magazines, made possible by printing presses that required machine tools to build. Clothing, food, dwellings and shops are all machine made, and the machines made by means of machine tools. What is the next thing?

To be sure, no one knows what will come next, but this much is sure, that the builder who finds out what is coming and prepares to meet the demand is going to make more money out of it than the man who only wakes up because some dealer comes and insists that he supply the tail end of a demand that is already passing.

How can anyone get near enough to this elusive "next thing" to put salt on its tail? Only by keeping posted on events all over the world. The new fad is as likely to originate in the brain of one man as another. If it should be demonstrated that there is life on Mars, the telescope makers would have to run day and night to supply the demand. If someone stumbles on a new light that is not accompanied by heat, those who make the machinery with which the light is made will have to hire storage vaults to hold their profits. The next invention to become profitable may already be hidden in the pages of the Patent Office Gazette, a safe and sure hiding place. Who is going to find it?

A Correction

In the article on Methods of Machine Tool Design the bore referred to on page 561, first paragraph, 17th line, should have been 20 in. instead of 10 in. as printed.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Planing a Helical Surface

BY WILLIAM DENTON

There is a machine much used in slate quarries for trimming the slate. The machine has a cutter head quite like that of a lawn mower except that it is heavier and carries but one blade. It is very essential that this blade, which is of thin steel, should be firmly supported throughout its length by the iron of the cutter head and that it should conform to a true helical curve. The

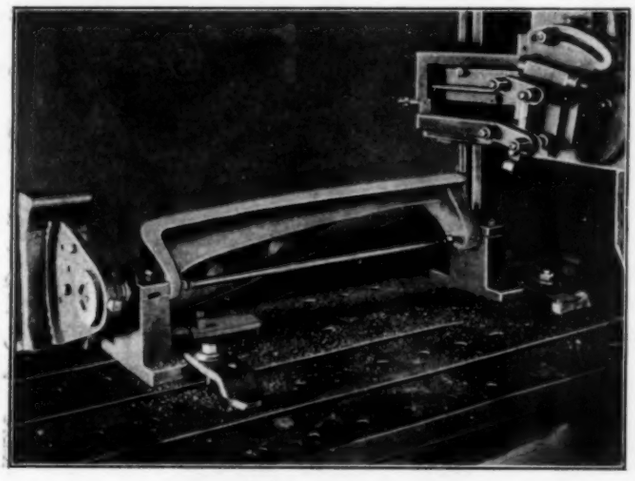


FIG. 1—FIXTURE FOR PLANING A HELIX

manner of planing the helix is shown in the illustrations.

To the back of the planer bed, opposite the operator's position, there are bolted two brackets to which is attached a taper bar very much like that used on a lathe for turning tapers, except that it stands in a vertical instead of a horizontal plane. A pair of centers are fastened to the planer table at the right distance apart to take the cutter head to be planed. To the "live" center, outside the bracket, is keyed a segmental gear that meshes with a short rack carried in an upright position by a slide that is a part of the "headstock" bracket of the centers.

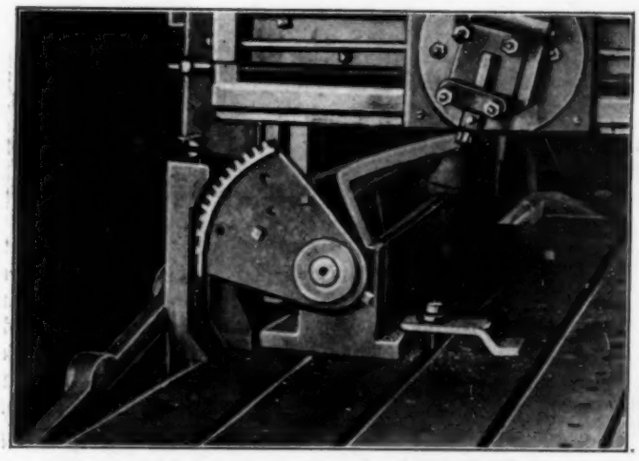


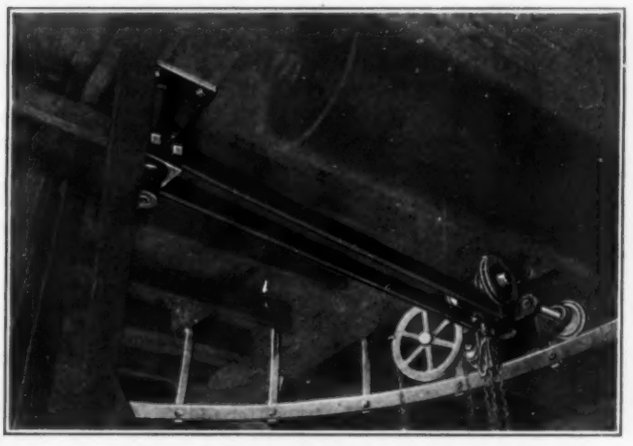
FIG. 2—END VIEW, SHOWING SEGMENTAL GEAR AND RACK

In the lower end of the rack is a stud upon which swivels the block that slides in the dovetail groove of the taper bar and causes the rack to rise and fall as the planer table passes to and fro. Fig. 1 shows the fixture with a cutter head in place that has just been planed and in Fig. 2 may be seen the segmental gear and rack in extreme position. It is obvious that any desired helix within the capacity of the device may be obtained by merely adjusting the angle of the taper bar.

Home Made Crane to Serve Large Lathe

BY MILTON WRIGHT

The crane shown in the illustration was made to serve a large lathe and was put up many years ago when it was not as easy to obtain machinery for this purpose as it is now. The central stud upon which the arm swings is attached to the beams that support the floor above, directly over the center line of the lathe. The arm itself is made of two pieces of iron of rectangular



OVERHEAD CRANE TO SERVE A LATHE

section attached to a casting which turns upon the stud and, at its outer end, to a two-wheeled truck running upon the semi-circular track, also supported from the floor beams.

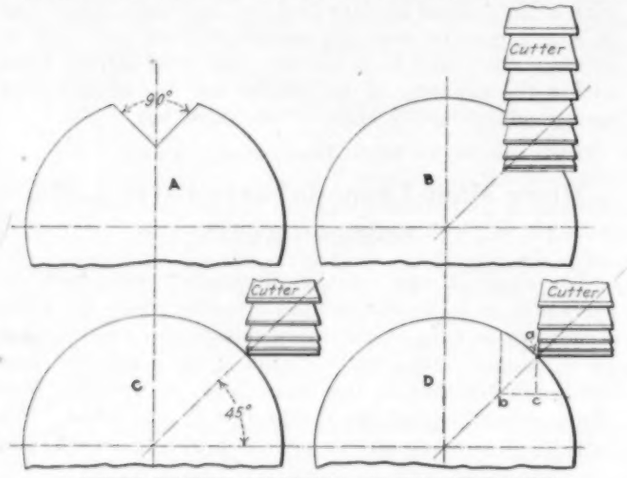
The arm with its two parallel members forms a track for the trolley from which the hoisting block is slung. As the length of the arm is about half the length of the lathe bed, a load may be supported over practically any portion of the length of the latter and, as the arm swings out to a right angle, the load may be conveniently deposited upon the floor or a truck at the rear of the lathe. The crane was built at the Bennington Machine Works and has been in service for many years.

Solving a Problem

BY R. H. KASPER

The writer recently saw a workman overcome a difficulty in a rather ingenious manner. A disk required a 90-degree V milled in the circumference to a specified depth, as shown at *A*. In the absence of a 90-degree V-shaped cutter and with only a plain milling machine at hand, the workman decided to use a square cutter by cutting at a point off the center, as shown at *B*. The proper distance off center and the depth to be cut at first puzzled the man but, having a knowledge of simple mathematics, he proceeded as follows.

He first set the disk with the center line at an angle of 45 degrees with the milling machine table. He then set the table so that the corner of the cutter just touched the disk at the point of intersection of the



STEPS IN THE SOLUTION OF THE PROBLEM

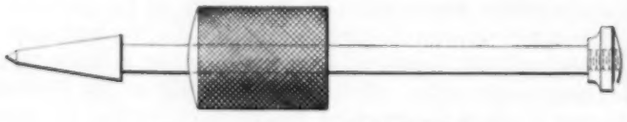
center line with the circumference, as at *C*. With this as a starting point, he drew in his imagination the triangle *abc*, as shown in *D*. As the distance *ab* was given, it was merely necessary to solve for the length of the sides *ac* and *bc* by the formula $ab^2 = ac^2 + bc^2$.

As the sides *ac* and *bc* are equal, the side *ab* squared will equal twice the square of either of the other two sides. To find the length of the sides *ac* and *bc* it is necessary to solve for $\sqrt{\frac{ab^2}{2}}$. The length of the side *ac* gives the distance which the milling machine table must be raised and, as *ac* and *bc* are equal, it also gives the distance which the table must be moved to one side in order to give the required depth to the V.

A Weight Actuated Prick Punch

BY L. J. GAGNON

A simple and effective prick punch of the "automatic" type is shown in the accompanying sketch. The body of the tool is made of drill rod, properly hardened and ground all over. The cap button is screwed to the upper



AN AUTOMATIC PRICK PUNCH

end, the sliding weight being made of a conveniently larger size of stock, knurled, hardened and blued, for the sake of appearance.

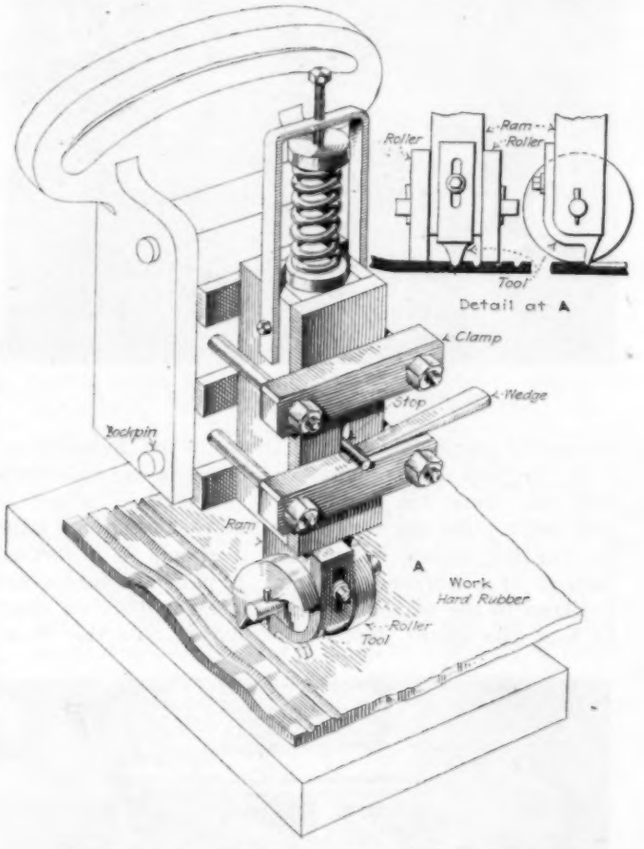
To use the tool the weight is held between the thumb and middle finger, with the index finger resting upon the cap button. The point is then located at the line intersection or other place that it is desired to mark and the weight released. This tool possesses an advantage over the spring actuated type of automatic in that the point will "stay put" and will not jump away at the instant of striking. There is no recoil. If a deeper impression is desired the weight may be raised and released several times.

Planing Vulcanized Rubber

BY BERT CROUSE

While working at the Youngstown Foundry & Machine Co., Youngstown, Ohio, we had a hard rubber plate 18 ft. long, 4 ft. wide and $\frac{1}{4}$ in. thick in which grooves $\frac{3}{32}$ in. deep and $\frac{1}{8}$ in. wide were to be planed the full length, covering the whole surface.

While the rubber was hard to cut with a regular



RIGGING FOR PLANING VULCANIZED RUBBER

metal cutting tool, the great difficulty was due to its irregular surface and its warped condition which prevented it from lying flat on the planer table. It was utterly impossible to get a good job by planing it in the regular way, as the tool would cut deep in the high places, so the device shown in the accompanying sketch was made. A cast-iron box was made to suit the toolpost and fitted with a ram which carried the tool. Two pressure rollers were attached to the ram and a coil spring mounted at the top of the ram sup-

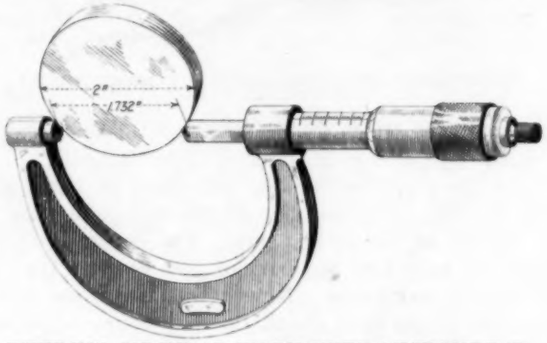
plied the tension to keep the rollers against the work. A stop-pin screwed in the ram midway of its length permitted it to move up and down through a slot. Pushing a wedge between the stop-pin and tool clamp at the end of cutting stroke would raise tool up for the return stroke, pulling wedge out at the beginning of cutting stroke would let tool down to cutting position. The apron was locked with a lock-pin as the pressure on the rollers tended to lift it.

This device enabled us to make a good job out of what seemed an impossibility.

Equal Divisions on Periphery of Disk

By Robert F. Smith

To divide circular work into more than two parts I find the method shown by the accompanying illustration to be simple and accurate and much more convenient



DIVIDING CIRCULAR WORK WITH MICROMETER

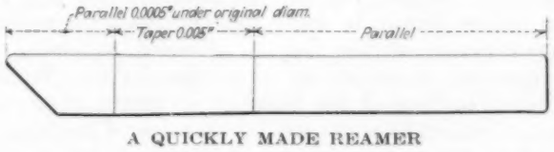
than using dividers for the same purpose. The disk shown was 2 in. in diameter by $\frac{1}{16}$ in. thick and was to be divided in three parts.

By reference to a table of regular polygons the length of a side may be found by multiplying the constant there given by the radius of the work. In this case the result is 1.732 inches. First scribing a starting point on the periphery of the disk by means of a try square, a micrometer is set to the required distance of 1.732 in. and the remaining two points determined by placing the tool against the work as shown.

A Small Reamer That Is Easy To Make

By F. B. Shoemaker

In tool work it is often necessary to ream small holes for which there are no standard reamers and the toolmaker is obliged to make them for the job. A reamer that is very quickly and easily made and will prove very satisfactory is shown in the accompanying sketch and is herewith described. If a hole is to be reamed to, let



A QUICKLY MADE REAMER

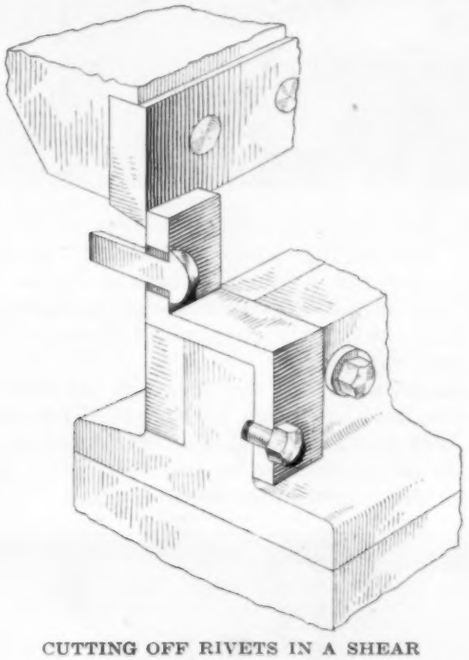
us say, a drive fit for a certain size of drill-rod, cut off a piece of the rod long enough to make the reamer. Put it in the chuck or collet of the bench lathe and polish down a short distance on one end, equal to one and one-half diameters, to a diameter 0.0005 in. under the original size, taking care to keep this part parallel.

Turn the piece around in the chuck and catch it by the new diameter. Then, with a file, taper it back for an inch or so of its length to a diameter of about 0.005 in. under the original size. From this point to the opposite end it should be made parallel and of the smaller diameter. Next, file or grind an angle of about 45 deg. across the cutting end, as shown in the sketch, and round off the sharp corner about a quarter of the way to allow the tool to enter the hole easily. In hardening, do not dip more than $\frac{1}{4}$ in. of the length and thus avoid warping.

Emergency Method of Cutting Rivets

By John J. O'Weil

Having about six hundred $\frac{3}{4}$-in. rivets to cut to length in a hurry, there being none of the proper length in the shop, and the only machine available being a shear, we rigged up the device shown in the sketch. A piece of wrought iron was bent as shown to go over the lower



CUTTING OFF RIVETS IN A SHEAR

shear blade and held in place by drilling and tapping one $\frac{3}{4}$-in. hole in the lower holder.

A hole through this wrought iron bracket accommodated a tool steel bushing of a size to take the rivets, the bushing being forced to place and set with the cutting face flush with the surface of the bracket, so that the upper blade would pass close to it. The entire time of rigging up and cutting the 600 rivets was less than three hours.

Distinct White Graduations

By P. A. Daschke

Clear white legible reading is accomplished on steel scales by brushing them over with Chinese white, allowing it to dry and wiping off the surplus against the graduations with a soft cloth.

Shaving Pinions in a Safety Punch Press

By Herbert Crawford

The gearing in the recording mechanism of the meter made by the Neptune Meter Co., Long Island City, N. Y., uses many small pinions. These are finished by the shaving process in the press and die shown in

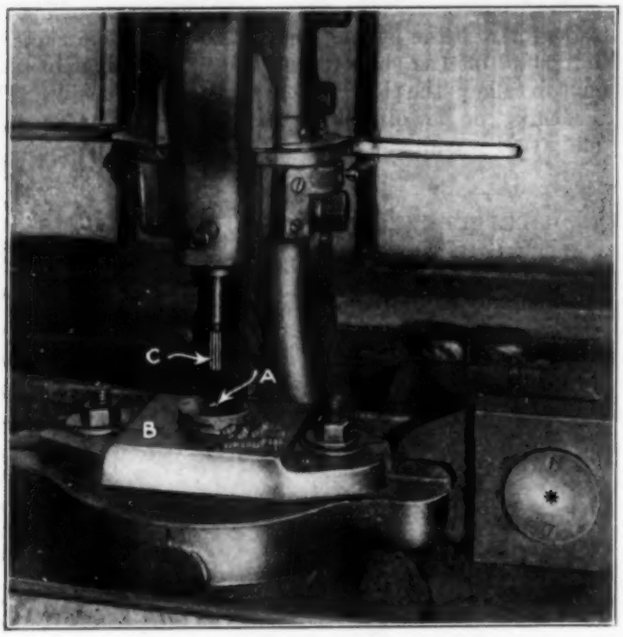


FIG. 1—PRESS FOR SHAVING PINIONS

Fig. 1. The pinion, which has already been cut, is placed in the nest *A* which is fastened to the shaving die *B*, and forced through the die by means of the plunger *C*. This gives an excellent finish to the teeth and is very rapidly done.

To insure safety to the operator, the double hand control is used as shown in Fig. 2. This device requires both hands to be up and out of the way before the press can be tripped, so that there is no chance of getting them caught in the press.

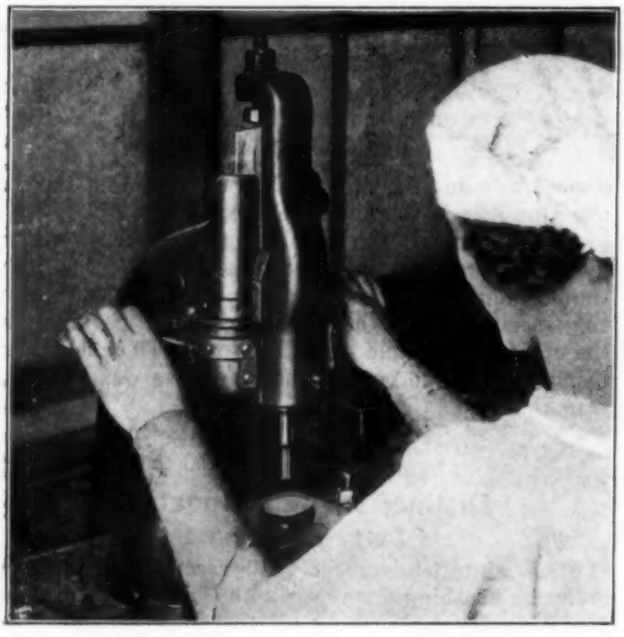
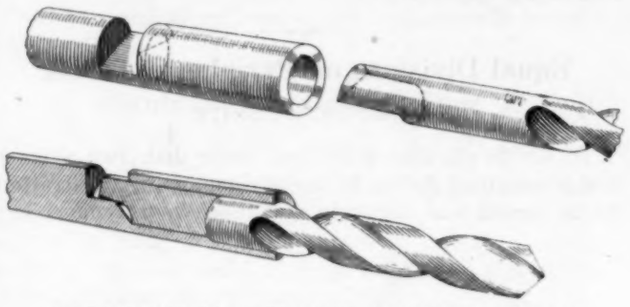


FIG. 2—TRIPPING DEVICE REQUIRES BOTH HANDS

Extension for Twist Drills

By F. B. Shoemaker

A good scheme for extending twist drills when the extension may be larger in diameter than the drill, or to fasten straight shanked drills in the taper shanks of broken or worn out taper shanked drills is shown in the accompanying sketch. With a drill a size smaller than the one to be extended, drill into the end of the extension or taper shank parallel with its axis for a distance



EXTENSION FOR STRAIGHT SHANKED DRILLS

of about three times the diameter of the drill and then ream out this hole with the drill to be extended.

Next file a slot across the extension at right angles with its axis, with one side of the slot coinciding with the bottom of the drilled hole. The depth of this slot should be such that the bottom just reaches the center line of the extension. Now grind away one half the diameter of the drill shank for a distance equal to the width of the slot and drive the drill into the extension so that the flats overlap. Making the length of flat on the drill a trifle longer than is necessary and leaving a round corner, will add to the strength of the joint while making this flat slightly tapered will facilitate the driving and insure a tight fit.

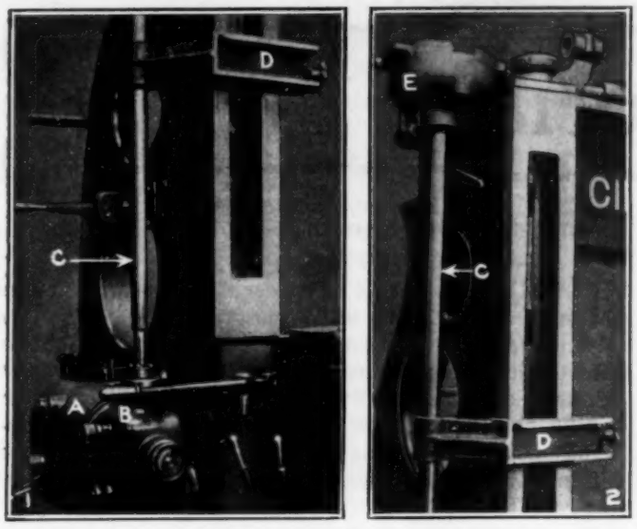
An Aligning Fixture That Aids in Assembling

By J. Bainter

Assembling operations on large machines can be greatly facilitated by the use of fixtures for properly holding parts while mounting them. Among a number of such fixtures employed in the plant of the Cincinnati Planer Co. at Oakley, Cincinnati, Ohio, one little device used in aligning the vertical feed shaft on a boring mill is worthy of note.

The parts of the feed mechanism of the 42-in. boring mill shown in Fig. 1 are assembled in the following manner. The feed box *A*, which has been previously assembled as a unit, is put on the side of the housing in the usual manner on the pad provided for it. Then, the reverse box *B*, in which are the gears for reversing the direction of the feed, is doweled in place. The reverse box is located at its proper distance from the finished surface of the housing by means of a special gage that can be employed for all sizes of machines. A straightedge is first laid on the finished surface of the housing, and a mandrel is placed in the large hole at the top of the box. Then, by using the gage, the proper position of the box can be easily determined.

The vertical feed shaft *C* is now put in place. In



FIGS. 1 AND 2—ALIGNING FIXTURE HOLDING VERTICAL FEED SHAFT IN PLACE WHILE ASSEMBLING

order to hold it in the correct position so that the top of it will be in proper alignment, the fixture *D* is clamped on the housing of the machine. With the fixture holding the shaft in place, the rapid traverse bracket *E*, see Fig. 2, at the top of the housing is doweled in place. This bracket contains the bevel gears used in driving the horizontal shaft at the top of the machine for the rapid traverse. The gears are put in place with the aligning fixture still mounted on the housing. Although the fixture is rather small and seems insignificant, its use enables very much more rapid assembling than is possible without it.

Limitation of Piston-Aligning Gages

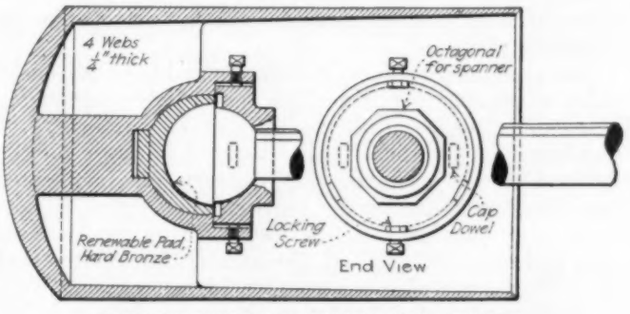
BY J. T. TOWLSON
London, England

Piston-aligning gages are as common as dust in March, as are also the innumerable appliances for securing accurate 90-deg. fitting of the piston pin. Notwithstanding the truth of the above, one unfamiliar with details would be surprised to witness the amount of touching up, padding, and bedding in of the contiguous parts of piston accessories on the assembly bench. Why is this the case? I believe there is a reasonable answer.

Take, for example, the piston-aligning gage shown in the Shop Equipment News of the *American Machinist*, on page 982, Vol. 56. This gage will show only whether the piston lies at 90 deg. with the big end bore of the piston rod. Its limitation is that it will not show whether the tested part of the piston is the correct distance from the face of the big end of the rod. This test might easily have been made, if the gage had been provided with a micrometrically graduated collar fitting on a threaded part of the arbor. If the two faces of the big end of the rod are intended to be the same distance from the piston diameter, nothing is more simple than to test one side of the piston with the one face at the big end of the rod touching the face of the collar, and then to turn the piston rod round 180 deg. and try it again. Should the faces of rod and piston not simultaneously touch the straight edge and the graduated collar, the detail either becomes a reject or must be dealt with by the assemblies.

Mechanics accustomed to motor-engine building will readily agree that accurate jigging of a member will guarantee that such part is passable by the inspector. They will further agree that such jigging of one part only does not fill the bill. Other parts, of which the jigged part forms but a detail, unless jigged too, may be out of accuracy and, if so, one of the parts will require "facing to make it fit in." This is the cause of the congestion of work at the assembler's bench. Much more could be written in support of the above but limitation of space forbids. Just to complete the article as briefly as possible, a few remarks will be made with reference to the dispensability of piston aligning gages. Methods, designs and contrivances, religously believed to be indispensable today, will be obsolete and altogether dispensable tomorrow, while devices we believe to be new and original, or operations we believe to be impossible to perform, have probably been in constant use and practice for a long time in other shops. To come closer down to the concrete, is the common gudgeon pin, as applied to every internal combustion engine, indispensable? Is it the best device for the purpose of taking the explosive thrust of the piston and conveying it to the crank of the journal? Personally, I do not think it is.

In the first case, it is a most untractable member of the engine's make-up. It is a law unto itself and all parts must give way to it. No end of money has been expended on jigs and fixtures as a means of guaranteeing the necessary 90 deg. off the piston's geometrical center, and yet, notwithstanding such cost for tools, the smallest hard spot in the cast iron surrounding the hole will undo all the good provided by the expensive tools.

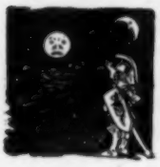


PISTON AND ROD WITH BALL JOINTS

In the second case, "the nicest affairs of mice and men oft gang aglee" and frequently well fitted gudgeon pins have got loose, moved end-wise, and badly score the cylinder. My idea is to knock out the troubles arising from intractability and abrasive danger by a change in design. I suggest a piston rod with a ball end as a substitute for the common wristpin. The sketch herewith shows the idea.

Such a device is tractable and yet, while able to perform its proper task of driving the crank quite as well as the gudgeon pin, it possesses none of its faults. No piston-aligning gage will be required and no more money expended on expensive jigs and fixtures for boring the gudgeon hole truly and no more occasion to leave $\frac{1}{16}$ in. or $\frac{1}{8}$ in. between the sides of the big end of the rod and the crank cheeks, as is often done. With the ball end the rod is tractable in all directions, while it also allows the piston to creep around in its cylinder, creating a glassy bore in the cylinder.

Editorial



ONLY one man ever stopped the sun and moon in their courses—and he had divine assistance. As well try to stop human progress and yet men have tried. They have spent valuable time in careful study of some form of human endeavor and have said, "This is the way to do the job, this and no other." But almost before they have said it somebody has found a better way and their words were wasted. Engineers, wise in industrial ways, have established standards with provisions for change as knowledge broadens and skill increases.

"Where do we go from here?" is a better slogan than "Here we are."

An American Counterpart of the East Indian Magician

THE MAGICIANS of India have long been noted for their ability to make a plant grow from the seed and flower before the eyes of the astonished observer. Just how this is done we do not pretend to know but it is no more wonderful than the deeds expected of American machine tool builders. Of course machine tools differ from the bush of the Indian magician in that they are made by men and by processes that are familiar and readily comprehensible. Nevertheless the time required to complete the modern planer or boring mill is not far different from that required for the maturing of many flowering plants.

The prolonged business depression and the consequent habit of buying for immediate needs only is probably responsible for the cautious attitude of purchasers of machinery of all kinds. It is no excuse however for the demand of the customer for delivery of complicated machinery in an impossibly short space of time. Almost every statistical service has been warning the business men and manufacturers of the country for months that the rising wave of prosperity would mean rising costs of equipment and difficulty in obtaining deliveries but in the face of these warnings the purchasers have delayed and procrastinated in the placing of orders which might well have been signed weeks or months ago. They are now feeling the pinch of demands which cannot be filled. Hand to mouth methods may be very well in a falling market or in a time when money is tight, but under present conditions there is no excuse for them. Instead of saving money they mean greater expenditure in the long run. Rush work and overtime are expensive luxuries.

At the recent convention of the American Gear Manufacturers' Association, one of the most progressive members of that body announced that he was rapidly getting in shape for the business he expected to get during five years of prosperity. Additional machinery has been purchased and more is on order and, as a consequence, his shop is in the pink of condition to accept the increasing business that is being offered. If all machinery users were as wise and aggressive as this man, the situation of the machinery builders and of the country in general would be far better than it now is and the next depression would be farther off.

Is Industrial Development Necessarily Ugly?

THERE IS A school of modern writers who delight in painting lurid word pictures of the filth and gloom surrounding the modern industrial plant. Their efforts have been so successful that the average reader of American magazines is convinced that all manufacturing plants, especially those in the metal trades, are unpleasant, demoralizing places in which to work. Unfortunately the descriptions are no exaggeration of the conditions existing in many shops.

On the other hand, we know of not a few machine shops that are kept as clean as a New England housewife's kitchen, shops that are pleasant to visit and pleasanter to work in, for the cleanliness is but an outward manifestation of the sound management within. The names of some of these shops will be found on our advertising pages, have been there for years, in fact. Their honorable and prosperous history is sufficient evidence that machine shops are not necessarily ugly and that clean, pleasant surroundings are an incentive to the men enjoying them to take pride in themselves, their work and their company. A liberal use of paint, soap, water, and elbow-grease goes far to raise the tone of any shop and brings returns, intangible though some of them may be, far in excess of the outlay.

Four Miles a Minute

THOSE who are interested in the progress of aviation, and that includes nearly everybody, cannot but rejoice at the strides which have been made in the past few months. Lieut. Doolittle's one-stop flight from coast to coast, Macready and Kelly's thirty-five hours in the air, and now the new records for speed by the planes entered by the army in the meet at Detroit are all notable. Averaging 206 miles per hour over a 156-mile course with several turns sets an entirely new mark for human travel. Approximately three and one-half miles per minute or over 300 feet per second, comes the nearest to annihilating space of anything yet accomplished. And even this was eclipsed in a straightaway flight at the rate of 248 miles per hour, or over 4 miles a minute.

We cannot overlook the fact that this great achievement is due primarily to that pioneer of practical aviation, Glenn H. Curtiss, for, without in any way detracting from the discoveries and achievements of the Wright brothers and others, it was Glenn Curtiss who won the first aircraft prize for a mile race in 1908 and a year later at Rheims brought home the Gordon Bennett trophy by flying 12.42 miles in 15 minutes, 56⅕ seconds. Curtiss also made the spectacular flight of 142 miles from Albany to New York so early in the game that it was necessary to stop three times for fuel and oil.

As if to crown his achievements, although he is still a young man, both the army planes which outdistanced everything in the air, are a result of the experience of Glenn Curtiss and his organization. They were not

only Curtiss planes with his designs of radiators built into the wings, but Curtiss motors as well. It is not often that a pioneer is able to keep pace with the development of a new industry in such a way and it is gratifying to see one who has been able to keep abreast of the times in such a rapidly developing science.

The pilots too, must not be overlooked. Without them the best planes in the world are of little value. The consistent performance of the two ships is noteworthy and gratifying. The winner, Lieut. R. C. Maughan averaged 206 miles an hour while Lieut. L. J. Maitland averaged 203, although one lap of the latter's flight was negotiated at the rate of 216.1 miles per hour. Maitland's power gasoline pump failed after the first lap and he drove the remaining distance by handling the ship with his right hand and pumping gasoline with his left. And a 375-hp. motor is hungry for gas all the time. Maughan was also under a heavy mental strain all through the race and both pilots deserve great credit for their performance.

From 49 miles an hour in 1909 to 248 miles an hour in 1922 is remarkable progress. Moreover, when we consider that the planes which accomplished both feats are from the hands of the same designer, we are impressed both with the short time required for aircraft development and the way in which a pioneer has kept not only abreast, but in advance of the times.

The Growth in the Use of Grinding Machines

THE USE of grinding machines has become so common in almost every line of machine production that we are apt to forget how young the process is as a real manufacturing possibility. It does not require a Methuselah in the machine industry to remember when grinding was an extra operation, used only on hardened surfaces, to correct the distortion due to heat treatment. It was a slow process too, removing a very small amount of metal and doing little more than making sparks and imparting a more or less smooth finish.

The development of better grinding wheels, better machines and the experience gained in the use of both has brought grinding into a very prominent position as a means of finishing either cylindrical or flat surfaces. Instead of being an additional operation, it now merely replaces finish turning, boring or planing and, in some instances, also eliminates the roughing out as well, as in the case of crankshafts. Many varieties of surfacing work are now done on disk grinding machines or machines using ring grinding wheels and at an astonishing rate. Much of this work was considered outside of the grinding field but a few years ago.

Among the newer developments in grinding are centerless grinding, form grinding and the removal of heavy cuts by surface grinding. These are three phases which men responsible for economical production will do well to study carefully. They seem destined to play an important role in the reduction of machinery costs.

The almost unbelievable results obtained with modern grinding wheels, the small amount of wear which enables form grinding to be done with unusual accuracy and the growing belief that even greater developments are under way, make it imperative that we study the possibilities of grinding even more closely than in the past. In too many cases, when grinding has not proved entirely successful, the fault lay with the machines or methods employed rather than with the process itself. Properly designed spindles in suitable bearings, in which both temperature and lubrication are considered, are essential to success. Correct wheels, feeds and speeds also are necessary. It is very easy to make a mistake as to what is right without a wide experience in similar work.

While grinding will not supersede all other methods of machining, it is likely to make still further changes in our methods of production. It is invading new fields and will continue to do so as we learn more about it. The production man who does not study grinding because of failures in the past, is sure to fall behind. Later knowledge, and the experience of others who have succeeded, should be earnestly sought after and applied. It is a study which will pay big dividends.

When Should Machine Tools Be Replaced?

THE QUESTION as to when a machine tool should be replaced is not often considered in a methodical way. Instead it seems to be taken for granted than one may let "nature take its course." If the machine has become unfit for further work there will certainly be somebody to notice it and demand will then be made for a new one.

In shops where machine tools are the chief means of production, such hap-hazard methods, or rather lack of methods, should not be tolerated. Instead, a deliberate attempt should be made to find out beforehand at what age a machine should be replaced. We are not referring to the substitution of a different kind of machine, or even of an improved tool, but simply to the degree of fitness left after a number of years of service.

It needs very little argument to show that neither should a machine be kept after it has passed its hundredth birthday, nor should it be discarded after a year's service. It is very evident that the point of greatest total economy lies somewhere between these extremes. This point may be different for various classes of machines, even for different makes of the same class, and further, it may be different for identical machines, used in different shops or for different purposes in the same shop. But, and this is the point, the economical life of every machine should be known, not to a day but accurately enough to make it the basis for action. It is a safe guess that, if this were done there would be replaced many machines which now lead the lives of invalids, pampered and doctored and demanding new expenses for repairs besides reducing and interrupting production.

Just Suppose

SUPPOSE you were proprietor of a shop with, say, a hundred men, and suppose these men felt that they had not been doing as much work as would have been possible. Suppose they speeded up, and studied their work, and co-operated and burned the midnight oil, just to increase production and to have the satisfaction of having fully earned their wages. Just suppose they did. Would you say to them:

"Why boys, this will never do. You are turning out more than twice as much work as I expected, and all for the same wages. No, really, this is not fair. I will have to double your wages, and maybe more."

Would you say this?

Oh, well! What is the use of asking foolish questions? But—

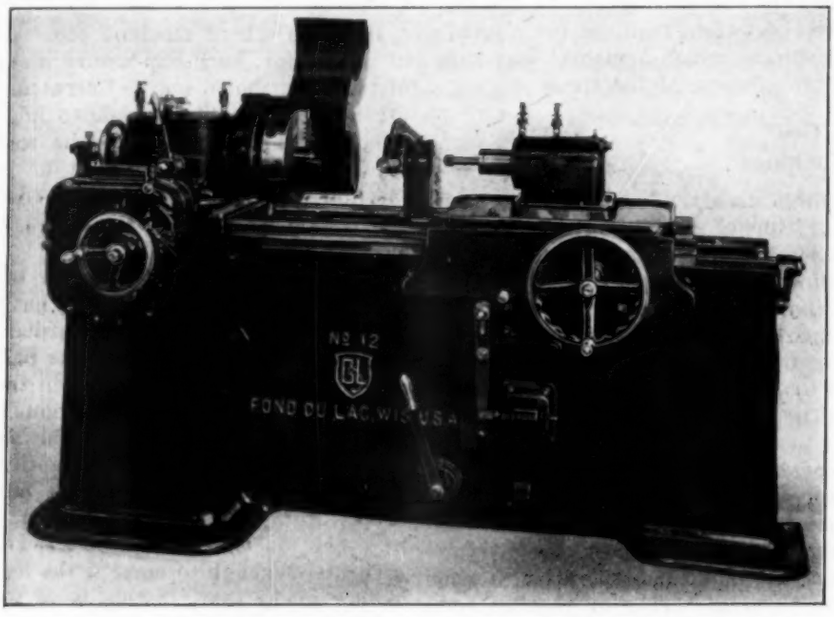
Just suppose.

Shop Equipment News

Giddings & Lewis Automatic Internal Grinding Machine No. 12

A grinding machine that is intended to perform automatically internal grinding operations on parts such as employed for automobiles and machine tools, so as to eliminate hand plugging by the operator, has recently been developed by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. A much lower degree of skill is required of the operator than is usual for internal grinding operations, as the machine itself grinds holes to a finished size with but slight attention from the operator.

The feature of the machine that enables its operation is an automatic gaging mechanism incorporated and correlated with the driving and feeding mechanisms. After the operator chucks the piece and starts the feed, the machine will grind to the finished size, automatically trip the carriage feed, and return the carriage to the rest position. Means is provided to care for wear of the wheel. The exact action of the gaging device will be described later in connection with the feeds of the machine. The bar gages used on the machine have a much lower cost than plug gages and their life is greatly prolonged because of the fact that they revolve at the same speed as the work and the mechanism employed for entering the gages in the work reduces wear to a minimum.



GIDDINGS & LEWIS AUTOMATIC INTERNAL GRINDING MACHINE NO. 12

The No. 12 machine, a front view of which is shown in the accompanying illustration, grinds holes from ¾ to 10 in. in diameter and up to 9 in. in depth. The total swing over the ways is 13 in., and the height of the spindle from the floor 44 in. The machine is motor driven and entirely self-contained, being equipped with push-button control. The motor is mounted on the back of the bed, which is of substantial construction and well ribbed to provide strength and rigidity. All parts of the machine having bearing surfaces are protected from dirt and abrasive material. The entire construction of the machine is rugged, so that continuous production should be obtainable.

The work head is mounted at the left of the machine on a circular bearing fitted to a cross-slide. Means of indexing the head quickly and accurately are provided, and tapers can be ground to an included angle of 30 deg. The work spindle runs in bronze bearings and is provided with six speeds. The speeds can be selected by turning the handwheel on top of the work head to any of the six indicated positions. Ball bearings are provided in the power transmission line from the motor to the spindle.

The drawbar for operating collet chucks is operated by a handwheel at the rear of the work head. A special three-jaw gear scroll chuck made by the Cushman Chuck Co., Hartford, Conn., is furnished as standard equipment. The chuck has a holding capacity of ¾ to 10¾ in. It is watertight and all parts are protected against grit. The body, which is filled with grease, is made of steel with all working parts hardened. The wheel carriage is of heavy construction, has large bearing surfaces on the ways of the bed and is guided by means of V's on both sides. The carriage is reciprocated hydraulically and the motor for driving the wheel spindle is mounted directly beneath the spindle and on the carriage, reciprocating with it, so that the life of the high-speed driving belt should be greatly prolonged. The wheel heads are tapered on the outside and are mounted in a corresponding taper in the wheel head housing and fastened in place by a locknut. In this way spindles can be easily mounted and removed. Each spindle runs in ball bearings in its own wheel head and separate steel pulleys are furnished with each spindle so that the correct wheel speed can be obtained.

The work is fed against the wheel at each end of the stroke, and two separate series of feeds are provided, ten for roughing and five for finishing. The carriage has a maximum travel of 20 in. and is provided with six traversing speeds.

Both sets of feeds are controlled by the use of two gages, a roughing gage and a finishing gage. In grinding the hole, when it reaches the size where the roughing gage can enter the work, the roughing feed is automatically disengaged. The finish feed automatically engages until the finishing gage can enter the

work, at which time the trip on the carriage automatically operates and returns the carriage to its rest position.

Coolant is handled by a directly driven centrifugal pump mounted within the machine, so as to force the lubricant through the center of the work spindle and on to the work. Means are provided for automatically cutting off the water supply when the wheel leaves the work and also for turning it on again when the wheel enters it.

The standard machine is motor driven by either a.c. or d.c. current. It requires a floor space of 7 ft. x 4 ft. 2 in. and weighs net 4,400 pounds.

Bausch High-Speed Multiple-Spindle Drilling Machine No. 2A

In order to apply the feed pressure directly over the center of the drilling area when a gang of drills is being used in one head, the center feed arrangement shown on the No. 2A drilling machine in the accompanying illustrations has recently been developed by the Bausch Machine Tool Co., Springfield, Mass. The construction maintains true alignment of the spindles and prevents the head from springing under the drilling pressure so that the drills do not align correctly with the bushings. Thus, the friction on the drills is decreased and the strain on the feed mechanism greatly reduced. Cramping on the ways is largely eliminated.

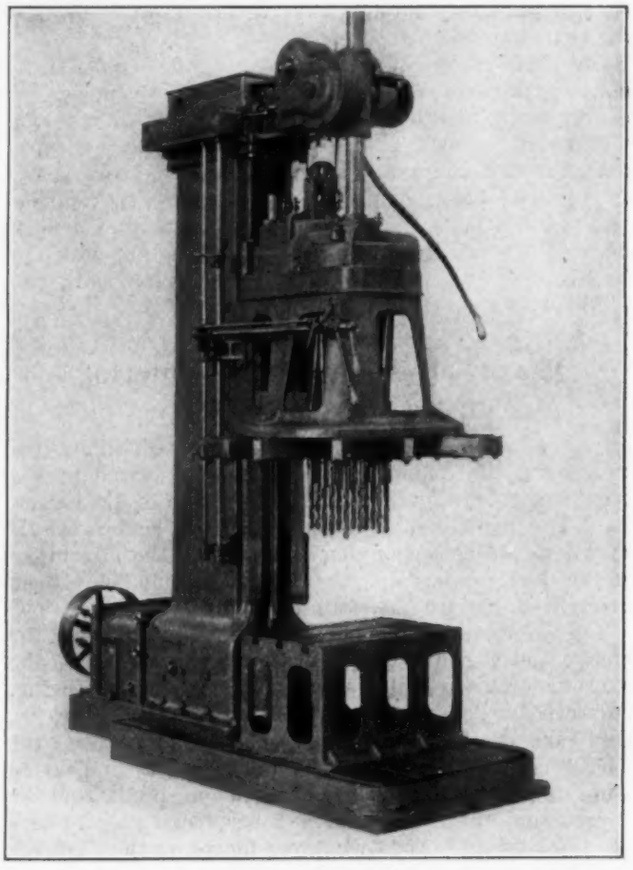
Heads of various sizes, both round and rectangular in shape, can be furnished. The head is of the type ordinarily employed on Bausch multiple-spindle drilling machines. It provides large vertical adjustment of the individual spindles and allows a minimum center distance to be obtained equal to the diameter of the spindles themselves. The head is provided with an automatic counterweight catch which prevents it from falling in case of accident to the cable.

The machine has a capacity in cast iron of twelve 1-in. drills, or the equivalent. Owing to the center feed construction, the distance from the center of the head to the face of the post is made greater than when the feed pressure is directly from the post, being 20 in. in this case. The width of the face of the post is 12½ in., and on it the head has a traverse of 25 in., the least distance from the spindle to the bed being 20 in. and the greatest distance 45 in. The bed is provided with T-slots and box or rotating tables can be furnished to suit the work to be done.

Four different methods of drive can be furnished, the first by means of a three-speed cone pulley, the second by a three-speed change-gear box motor-driven, the third by a three-speed change-gear box belt-driven, and the fourth by a direct-connected variable-speed motor. The main drive comes from the base of the machine directly to the head gears, so that the mechanism is simple. As illustrated, the machine is driven by a 5½-in. belt on an 18-in. pulley. Fifteen to 20 hp. are required for the operation.

The feed is accomplished by means of a heavy ram placed directly above the center of the drilling area. This ram is moved by a pinion which is connected through the change-feed gear box directly to the main drive of the machine. For each change of speed, of which there are three, there are three changs of feed, which vary according to different combinations from 0.0018 and 0.023 in. per revolution of the spindle. These speeds are standard, but feeds either faster or slower can be provided to suit special requirements. The head is operated by hand only when counterboring or in an emergency, or when adjusting the tools for height and alignment in the jigs. The pilot wheel for hand feeding is consequently located rather unobtrusively and is disconnected when not in use. In the illustration it cannot be seen as it is on the right side of the frame.

Roller bearings are used for shafts and ball thrust bearings wherever required. All driving gears are of steel. The column has a hole in the back so that small weights can be added or removed to properly adjust the balance of the head. An oil pump and oil tubes can be furnished, so that coolant can be employed. The grooves in the bed collect the coolant and supply it to the reservoir in the base.



BAUSCH MULTIPLE-SPINDLE DRILLING MACHINE

The ease of operation of the machine is the feature to which the maker calls especial attention. The quick approach and return of the head is operated by means of friction clutches in the feed gear box, so that the operator can by means of a conveniently located lever raise or lower the head at a fast speed. The head can come down at this fast speed until the drills actually touch the work, no care being necessary to prevent damage, since the friction clutch immediately slips when the drills strike the work. The power feed is then engaged, and upon completion of the drilling operation the head automatically returns at fast speed and stops at the starting position. This quick approach and return feature is not an attachment, but is built integrally in the machine.

The machine can be built for tapping in addition to drilling. In the tapping model, back gears on the head

are employed for reducing the spindle speed, these gears being engaged or disengaged while the machine is running, if desired. When performing a tapping operation, the operator first brings the taps down into the work by means of the quick approach. Further downward movement of the head is then controlled by the lead of the taps in the work. At a certain point, the direction of rotation of the taps is automatically reversed. After the taps have cleared themselves from the work, the operator engages the quick return and the head travels quickly to the starting position and stops, the spindles being automatically reversed and ready for the next operation.

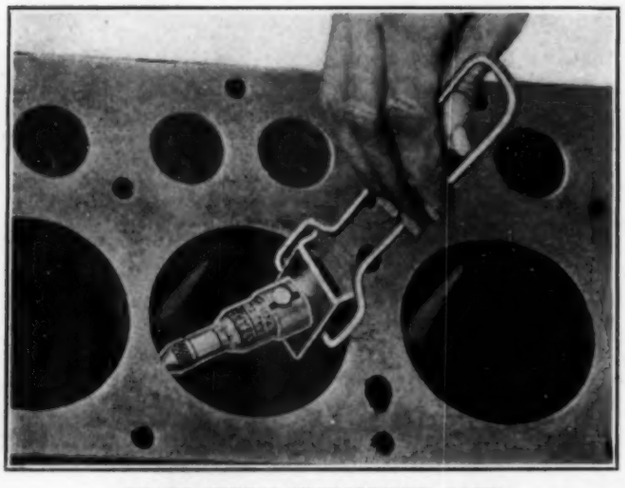
For performing counterboring operations an attachment operated by hand can be supplied. By means of a lever and gears the head is advanced very slowly and with great power. The attachment is employed especially for spot-facing and similar operations, back gears in the head being employed for reducing the spindle speed at the same time. The machine occupies a floor space of 3 ft. x 8 ft. 10 in., its extreme height with the feed ram in the up position is 12 ft. 3 in., while the height with the ram down is only 10 ft. 8 in.

Beard Self-Aligning and Centering Inside Micrometer Gage

An inside micrometer gage intended especially for measuring the diameters of automotive cylinders has been brought out by the L. O. Beard Tool Co., Lancaster, Pa. The method of using the tool for such work is shown in the accompanying illustration, the advantage of the device being that the measuring number is held at right angles to the cylinder walls.

The gage consists chiefly of the aligning base, the handle and the micrometer proper. Three sizes of the micrometer are regularly furnished, the ranges being, respectively, 2½ to 3 in., 3 to 3½ in., and 3½ to 4½ in. One turn of the screw advances it 0.050 in., and the barrel is graduated to 0.001 in. Figures indicating steps of 0.005 in. are placed on both the spindle and the barrel, those on the former member serving as a check for the reading. Thus whatever figure on the barrel is found opposite the zero on the spindle, will also be found on the spindle opposite the zero on the barrel. Both ends of the micrometer and the parallel edges of the base are hardened and ground.

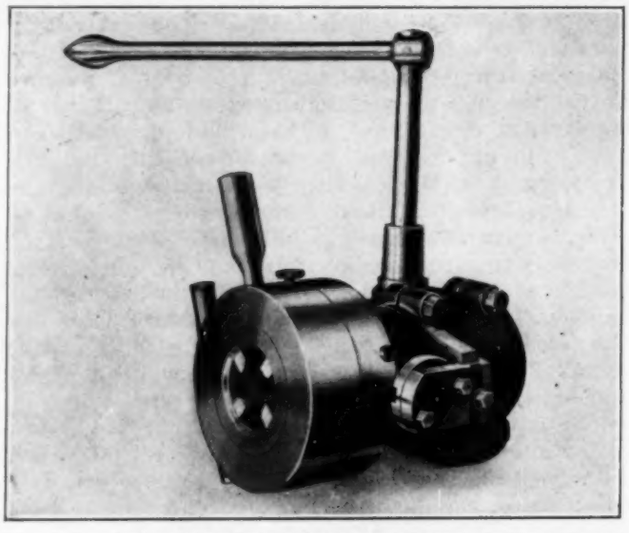
When in use the micrometer is placed in the bushing of the aligning base, in which it is a sliding fit. A ring can then be placed on the rear end of the barrel to keep the base from falling off. The tool is inserted in the bore to be measured, the base pressed against this bore, and the spindle screwed out until both it and the barrel end touch the bore. The base holds the tool in the proper position for obtaining the exact diameter of the cylinder, as the micrometer is both centered in the bore and perpendicular to the axis. The micrometer is then locked by means of the setscrew to preserve the reading, and the aligning base slid forward on the barrel so that the tool can be titled and removed from the cylinder for reading.



BEARD INSIDE MICROMETER GAGE

Hartness Taper Threading Die

The Jones & Lamson Machine Co., Die Division, Springfied, Vt., has placed on the market a new design of its self-opening die for the cutting of threads of any taper from zero, as on cylindrical work, up to 2 in. taper per foot. Set for the maximum taper the die will cut threads 1¾ in. long, and proportionately longer as the angle approaches the minimum. It is especially adapted to the cutting of staybolt threads and may be used in tandem with another die in the rear for cutting the parallel-sided portion of the thread.



HARTNESS TAPER THREADING DIE

As shown in the illustration the die is open to its fullest extent and the former-pin is out of the guiding slot. To set it in closed position for beginning a thread the operator pushes forward the short handle on the die sleeve until the former pin is brought into the slot in the adjustable former, and then he withdraws the die to its extreme position by moving the pinion lever at the top.

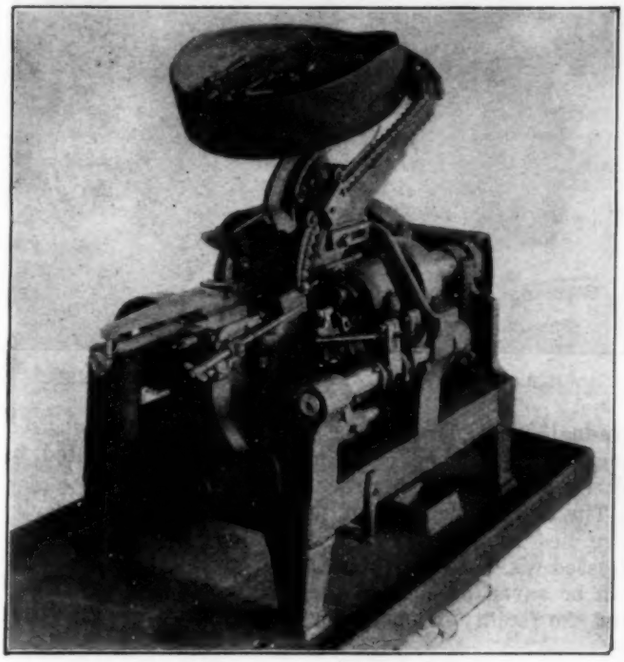
The die holder as furnished is intended to be bored in position in the machine with which it is to be used, thus bringing the tool into perfect alignment with the work spindle. The bushing in which the operating pinion has its bearing is eccentric, so that the pinion may be adjusted by a partial rotation of the bushing to compensate for any inaccuracy of alignment that may be manifest in the machine. Minor adjustments for diameter are accomplished by turning the knurled-head adjusting screw in the usual way.

The tool is made in two sizes. The No. 3 size will cut threads 1¼ in. in diameter at the large end, and the No. 6, threads up to 2 in. in diameter.

Cook Bolt and Capscrew Shaving Machine

The Asa S. Cook Co., Hartford, Conn., has recently placed on the market a new design of its bolt and capscrew head shaving machine. A single belt from the lineshaft drives a countershaft under the pan of the machine and from this countershaft all movements are derived, thus permitting the setting of a row of machines under and parallel to the lineshaft with just sufficient room between each machine to clear the belt.

Separate carriers are provided for the tools, one of which faces the shoulder under the head of the bolt or screw while the other is rounding or otherwise forming the end of the head, the cuts being taken simultaneously. These carriers are given a swinging movement about axes that are set at a slight angle to the center line of



BOLT AND CAP-SCREW SHAVING MACHINE

the machine, so that as the tools advance to the work they also draw slightly nearer together. This movement has the effect of clearing the tools immediately upon the finish of the cut and allowing them to withdraw without dragging. The carriers are independently adjustable.

The gripping device that catches each screw as it falls from the feed race has also been improved, gripping the screw by the shank end and steadyresting it as near to the head as possible without interfering with the shouldering tool, thus giving each piece a firm support close to the cut.

The hopper on this machine is constructed upon an entirely different principle than formerly employed. Instead of the usual revolving hopper this one is stationary and is supported by a hollow bracket, the upper end of which forms a bearing for a revolving shaft. To this shaft, at the point where it extends through the base of the hopper, there is keyed a four-armed spider —or "agitator," as it is called—which is caused to revolve slowly and keep the contained mass of bolts or screws constantly stirred up, so that an annular groove close to the side walls of the hopper is kept filled with the work. In the illustration all those bolts that may be seen lying close to, and as nearly as possible parallel with, the side walls are in this groove.

At the bottom of the groove is an annular ring, the upper surface of which is roughly serrated, and this ring is slowly and continuously revolved in conjunction with the agitator. The result of this combined movement is that the outer circle of bolts in the hopper is continuously moving forward toward the high side of the base, at which point the bolts are discharged into the feed race. It matters not which end of the bolt or screw is presented to the feed race, for as soon as a bolt enters the latter the shank end swings downward by gravity and the bolt is thenceforward supported only by the shoulder under the head.

It will be noted that the feed is at all times caused by the friction of the bolts lying upon the serrated surface of the moving ring (the arms of the agitator do not extend over the groove), so that there is no positive impulse and consequently no possibility of jamming. The rate of travel of the ring and agitator is very slow as compared with the movements of the machine, and may be varied by using different combinations of driving gears so as to keep the feed race full of work at all times.

The number of bolts in the hopper does not affect the feed, as the latter will completely empty the hopper and carry forward the last bolt as readily as the first one without hesitation or interuption. The duty of the hopper ends with the delivery of the work to the feed race; from that point forward the feed is by gravity only and the machine will continue to function until the race is exhausted.

The manufacturer is redesigning the entire line of bolt and screw machinery, which includes shavers, pointers, and die-threaders, and will equip all such machines with this type of hopper. The machine here shown handles bolts or cap-screws up to ½ in. in diameter by 4 in. long. Larger sizes are under contemplation.

Victor Receding-Chaser Collapsible Pipe Taps

The receding-chaser collapsible pipe tap made by the Victor Tool Co., Waynesboro, Pa., has recently been redesigned and improved. The basic principle of the design, such as described on page 915, Vol. 51 of *American Machinist* has not been changed, although the details have been altered somewhat.

Instead of using the ordinary tapered chasers for cutting a standard Briggs tapered pipe thread, and depending upon the length of the chaser to give the

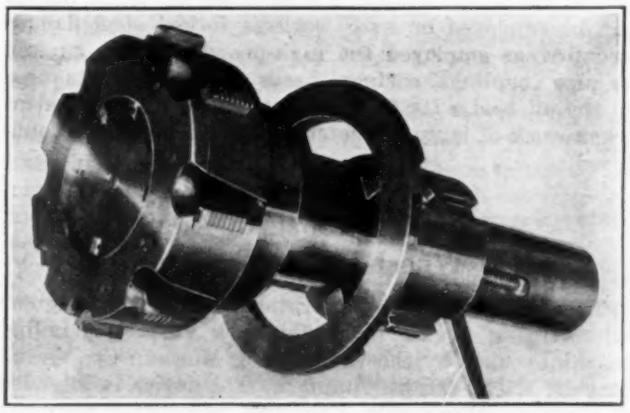


FIG. 1—VICTOR STATIONARY-TYPE COLLAPSIBLE PIPE TAP

proper length of the thread, short chasers are employed and are made to recede as the tap enters the work. A trip collar is set against the face of the work when the operation is started, and as the tap feeds in, it pushes back on the cam collar that controls the receding of the plunger on which the chasers are mounted.

The view in Fig. 1, which shows a stationary lever-operated type of pipe tap, illustrates the arrangement of the collar. Although formerly only one cam block was used, two blocks working in conjunction are now

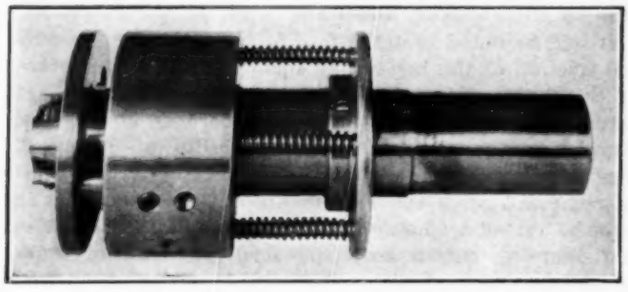


FIG. 2—VICTOR ROTARY COLLAPSIBLE PIPE TAP

employed so that the receding of the chasers is more positively controlled to give a more uniformly tapered thread. A tapered thread can be cut off at any length desired and have the taper uniform throughout its entire length. The design of the cam blocks has also been altered to make them more effective and positive.

A rotary type of collapsible tap, such as shown in Fig. 2, has also been altered in design. Instead of a detachable lever for setting the collars and chasers in position for cutting, a ring or collar has been substituted. Pressing forward on this collar by hand, or by means of an attachment on the tapping machine that comes in contact with the collar when the spindle is raised, the chasers can be set without stopping the machine. There are no projections from the cylindrical form of the tap, so as to safeguard the operator.

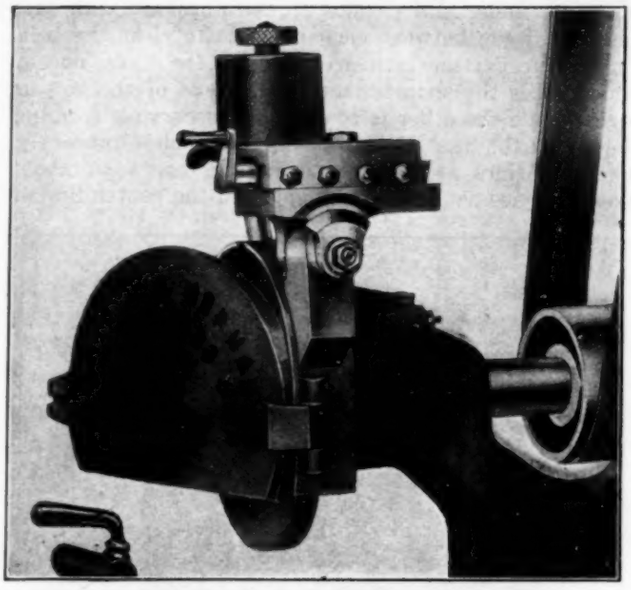
In both styles of the tap, means of adjusting the size with a range of $\frac{1}{16}$ in.. either over or under the size are provided. Adjustment of the trip collar permits cutting any length of thread desired. The tap requires from one third to one half less power to drive than the ordinary tapered thread tap, it is claimed, because unnecessary bearing has been eliminated by the use of the short chasers and a tapered thread is cut in virtually the same manner as a straight thread. Interrupted thread chasers are used when tapping steel.

The tap is furnished in sizes from $1\frac{1}{4}$ to 12 in. It can be employed on such work as forged steel flanges and fittings employed for high-pressure work, as well as pipe couplings, casings, heads and other parts used in the oil field. Its adaptability is particularly evident when work of large diameter or extra length is encountered.

Wilmarth & Morman Angular Wheel-Truing Device

The accompanying illustration shows the angular wheel-truing device with which all surface grinding machines made by the Wilmarth & Morman Co., Grand Rapids, Mich., can be equipped. The device is intended for use in shops salvaging and reclaiming worn-out milling machine cutters, reamers and drills, as well as those making a specialty of cast stellite cutters and tools. By the use of this device, the wheel can be easily formed to correspond to the outline to be ground.

The illustration shows the wheel-truing device in position for dressing the wheel face parallel with the table. The diamond is fed to the wheel by means of the knurled knob at the top, while the crank is employed to feed the diamond across the face of the wheel. By means of the



WILMARTH & MORMAN WHEEL-TRUING DEVICE

graduated dial, the device can be set at the desired angle, the diamond carrying member being tilted to either side for dressing the wheel face at an angle.

The chief advantage of the built-in wheel-truing device lies in the fact that the wheel can be properly dressed without disturbing the set-up of the work. Time can be saved because of the adaptability of the device and the facility of operation.

Kingsbury Automatic Horizontal Sensitive Drilling Machine

The Kingsbury Manufacturing Co., Keene, N. H., has made further developments in its line of automatic sensitive ball-bearing drilling machines. The recent or No. 8 machine embodies a fully automatic feed and control very similar to that employed on the machines described on page 1066, Vol. 53, and on page 1060, Vol. 54, of *American Machinist*. Although these latter machines have vertical spindles, the No. 8 drilling head shown in Fig. 1 is ordinarily operated with the spindle horizontal. The principal difference between the recent model of the device and the No. 1 machine previously described is that a cam has been embodied in the spindle controlling mechanism so that difficult drilling jobs can be more effectively handled.

The No. 8 drilling head has a capacity for drills from No. 60 to $\frac{1}{4}$ in. in diameter. Its operation is as simple as that of a power punch press, as the operator merely places the work in position, clamps it, and then presses the trip lever. There are seven ball bearings employed on the machine, so that friction is reduced as much as possible to make the machine sensitive. The worm employed in the mechanism is of hardened steel, and the gear of phosphor bronze.

An automatically controlled pressure feed system is

employed for the purpose of eliminating drill breakage. The action occurs through the cam and the friction rolls or gears seen on the side of the device. The driven gear is mounted on a lever held in mesh with the friction driving roll or gear by an adjustable compression spring. The cam is cut on the inside of this driven gear. The follower roller is mounted on a gear segment which meshes with a gear segment clamped to the feed shaft. The arrangement is such that the cam

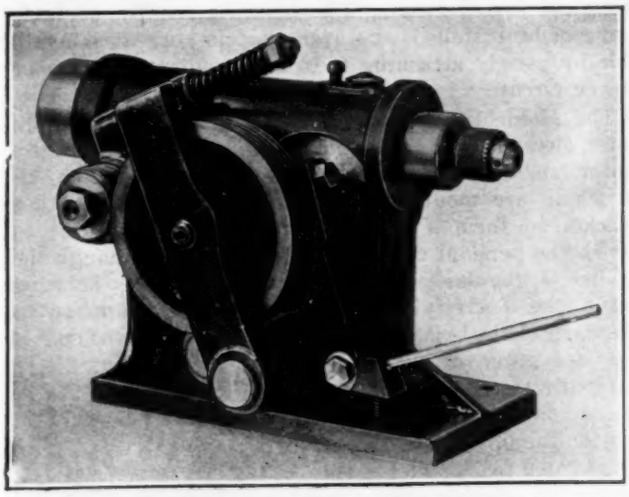


FIG. 1—KINGSBURY NO. 8 AUTOMATIC DRILLING HEAD

is revolved by the friction gears and feeds the spindle forward.

When the forward motion is resisted, as when the drill strikes the work, the follower roller is held momentarily and the rotation of the gears causes the cam to climb on the roller, thereby separating the friction gears, and permitting slippage. As the drill penetrates the work under pressure, the follower gives way,

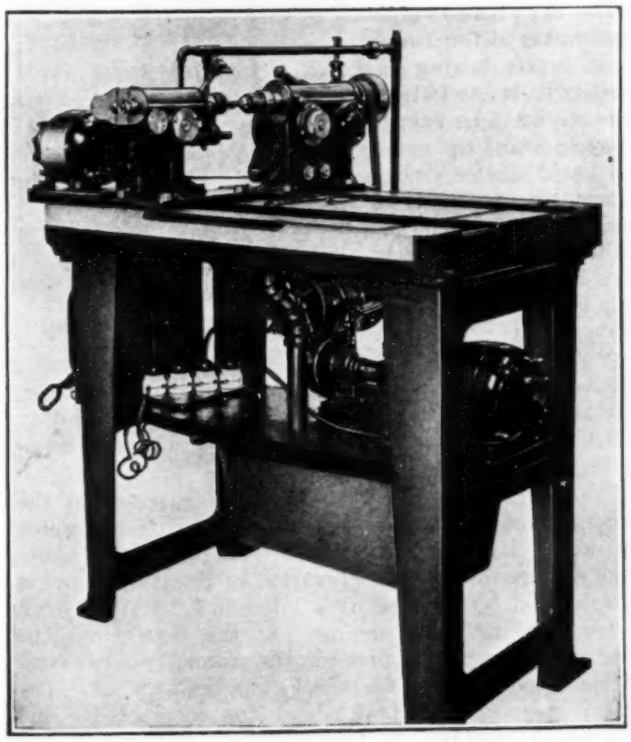


FIG. 2—KINGSBURY AUTOMATIC SENSITIVE DRILLING MACHINE

bringing the friction gears into contact again and causing the cam to revolve and again to separate the gears when further resistance is met. The motion is claimed to be so smooth and rapid that it cannot be detected as intermittent.

The standard cam employed gives a stroke of 1 in. to the spindle with a maximum feed of 0.011 in. per revolution. Thus the drill approaches the work and breaks through at a comparatively rapid rate, while the actual drilling feed depends on the pressure adjustment, the hardness of the work and the condition of the drill. Special cams can be used with one or two reliefs to permit of withdrawing the drill during the operation, so as to relieve the chips. The spindle has a total adjustment of 2 in. besides the 1 in. travel. It can rotate at speeds as high as 4,000 r.p.m.

The head can be driven by either a countershaft or motor, ¼ hp. being usually required. The spindle is 6¾ in. above the base, and the overall height of the machine is 9½ in. The length of the head when the chuck is in the back position is 14 in. The width is 7 in. and the net weight 50 pounds.

The head can be well employed in multiple for performing the same operation on several parts, or for performing different operations on the same part. In this way a semi-automatic machine for large production, such as when drilling oil holes, is formed. Fig. 2 shows a floor type of machine intended for cross drilling and burring chuck wrenches. The machine is equipped with a single No. 8 head, and with a special fixture which automatically clamps each wrench and then removes the burr from the work.

As many as four of these units can be mounted on the table if the production desired warrants this number. Thus one operator could care for all of them and the work could be progressing simultaneously in each. It will be noted that three small motors are employed, one for driving the drill spindles, one for the burring spindle and one for the lubricating pump. The three motors are connected to one motor starter at the left of the frame. Different arrangements of the work head and fixtures can be furnished to suit varying requirements.

Sigourney No. 0 High-Speed Bench Drilling Machine

The Sigourney Tool Co., Hartford, Conn., has brought out a drilling machine, designated as the No. 0 high-speed, bench-type, that is a departure in many respects from the regular line of Sigourney tools. As its name indicates, it is intended for bench service only, and is not provided with a column.

The machine is of the belt-driven type with two countershafts adjustably mounted upon the frame. Both belts are endless; the tension is maintained by moving the countershafts, both of which may be adjusted for center distance by turning conveniently located knurled-head screws.

The spindle, which is hardened and ground, is entirely enclosed and runs upon Norma ball bearings. There is no center hole in the spindle, but the lower end of the latter is fitted to the taper socket of a No. 1 Jacobs drill chuck that is regularly furnished as a part of the equipment. This chuck has a capacity ranging from 0 to ½-in. diameter drills.

Both countershafts as well as the loose pulley are

mounted upon Hess-Bright ball bearings. The normal speed of the first shaft is 1,000 r.p.m., and from this speed are obtained spindle speeds of 2,000, 4,000 and 8,000 r.p.m. The machines are capable of much higher

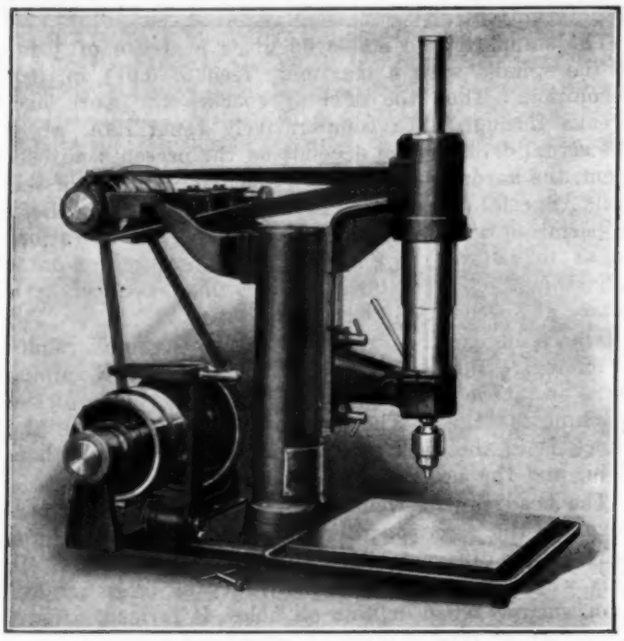


FIG. 1—SIGOURNEY NO. 0 BENCH-TYPE HIGH-SPEED DRILLING MACHINE

spindle speeds, which may be obtained by increasing the speed of the first countershaft.

The illustration in Fig. 1 shows the machine ready to run, and Fig. 2 shows a section through the spindle. It will be noted that the driving pulley is mounted independently of the spindle and that both sets of bearings are independently adjustable by means of easily accessible ring adjusting nuts. All bearings are standard commercial ball bearings, parts for which may be procured from any dealer in this class of material.

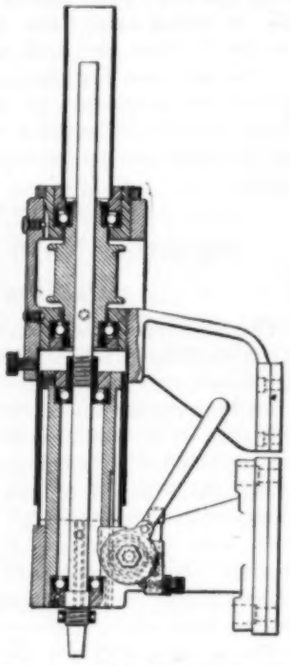


FIG. 2—SECTION THROUGH SPINDLE

The finished surface of the table is 7½x8 in. The head is adjustable vertically through a distance of 2½ in., and the maximum height from table to chuck is 3½ in. The vertical movement of the spindle is 1½ in., actuated by the usual rack and pinion with lever handle. The machine will drill to the center of an 8½-in. circle.

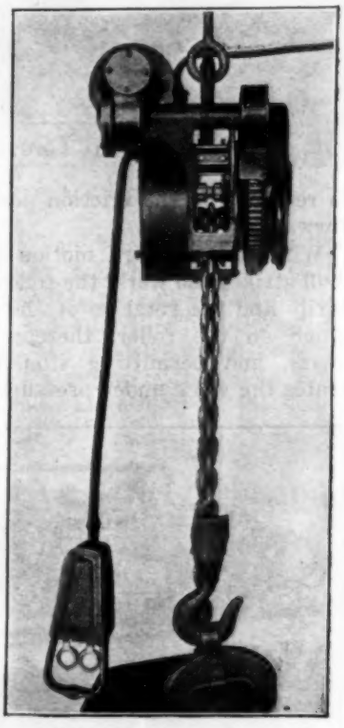
A clamp stop on the pinion shaft limits the vertical movement of the spindle, and this stop has a knurled head adjustment screw and locknut by which accurate adjustments for depth of hole are obtainable.

The machine occupies a bench space of 12x20 in. and the net weight is 50 lb. Boxed for export the gross weight is 87 lb. and the space occupied is 4½ cubic feet.

"Motorbloc" Electrically Operated Chain Hoist

An electrically operated material-handling hoist, designated as the "Motorbloc," has been placed on the market recently by the Motorbloc Corporation, Summerdale, Philadelphia, Pa. The device is intended for use in the field of operation lying between that of the standard hand-operated chain hoist and that of the traveling electric hoist which requires substantial overhead and electrical installations. The hoist is readily portable and can be installed wherever electric current is available by merely attaching it to a convenient lighting or power circuit.

The Motorbloc consists of a standardized steel chain hoist, electrified by the application of a small heavy-duty motor, reduction gearing and a slip friction clutch, all of which are mounted on a malleable-iron supporting bracket to form a self-contained electrifying unit to which the pendant controller is attached. Although the device is regularly furnished as a complete hoisting outfit, the electrifying unit can be readily applied to standard chain hoists already in service, so as to enable the operation of hand hoists by electricity. In the accompanying illustration the unit is shown built on a Franklin-Moore all-steel suspension spur-geared chain hoist. For occasional use at points where electric current is not available, or in the event of the temporary failure of electric power, the hand chain can be quickly applied, and the hoist operated as an ordinary chain block.



"MOTORBLOC" ELECTRIC CHAIN HOIST

The mechanism is manufactured for use on chain hoists having capacities from ½ to 10 tons. It is stated to be rugged so as to stand up under continued service such as a portable apparatus of this nature is generally subjected to. However, care has been exercised to avoid stressing the chain hoist mechanism beyond the loads and speeds for which it was proportioned for hand operation. The armature shaft and worm are carried in heavy-duty ball bearings and provision is made for adequate automatic lubrication.

The pendant controller can be easily operated by the fingers of one hand, leaving the other hand free to guide the load. By this arrangement, one man can easily handle large loads. The operation of the mechanism is safeguarded by the use of a ring-oiled friction clutch which prevents over-running. At the same time, the mechanism completely protects the motor from overload without the necessity for an electric limit switch. The maker stresses such features as the compactness and balance, as well as the lightness and strength of the hoist. The weight of the one-ton size is 148 pounds.

Garrett "Millerette" Milling and Multi-Purpose Attachment

The Garrett "Millerette" or multi-purpose attachment for lathes, planers, shapers and drilling machines has recently been placed on the market by the Production Machine Tool Co., 629 East Pearl St., Cincinnati, Ohio. This device is built in three sizes for lathes from 12 to 24 in. swing.

The Millerette can be employed to convert a lathe to do the work of a milling machine with a dividing head. A large range of milling can be done, such as cutting

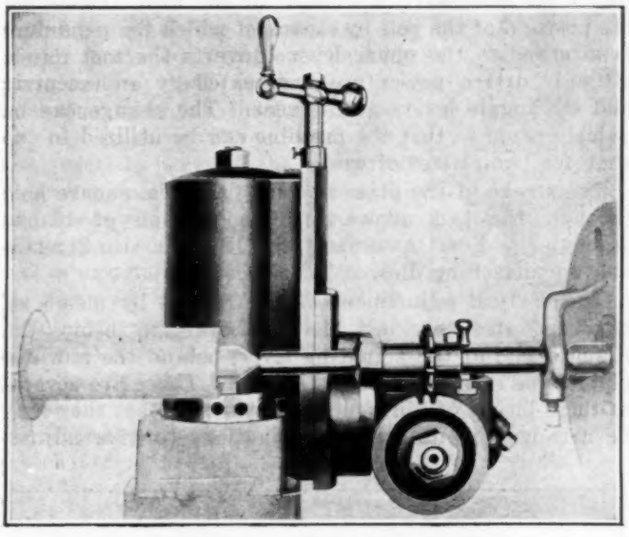


FIG. 1—GARRETT "MILLERETTE" ON LATHE

gears, both spur and bevel, surface milling, angle cutting and spline and keyway cutting. The device enables the small shop to do many classes of milling machine work on the lathe, and it saves setting-up time on special and single-piece jobs in the large shop.

The attachment fits the toolpost slot in the top slide of the compound rest of the lathe, as shown in Fig. 1, and can be as quickly clamped in position as the toolpost itself. The lathe supplies the power and carries the cutter on an arbor between centers. It also furnishes both longitudinal and cross feeds. In addition to the movement of the top slide and compound rest of the lathe, the down slide of the Millerette can be operated by a convenient handle. The device can be set at any angle, as both the down slide and index head turn on a swivel.

On a drilling machine the "Millerette" can be used to accurately space the holes to be drilled and to hold work requiring indexing. On planers and shapers it can be used as a dividing head. The index head in connection with the change gears furnished can be quickly set up, as only two gears are used at one time. The index plate shows the gears to be used and the required number of turns of the index handle to obtain divisions from 2 to 360. The parts of the device are illustrated in Fig. 2. Adaptability in operation and rigidity of construction are claimed for the attachment.

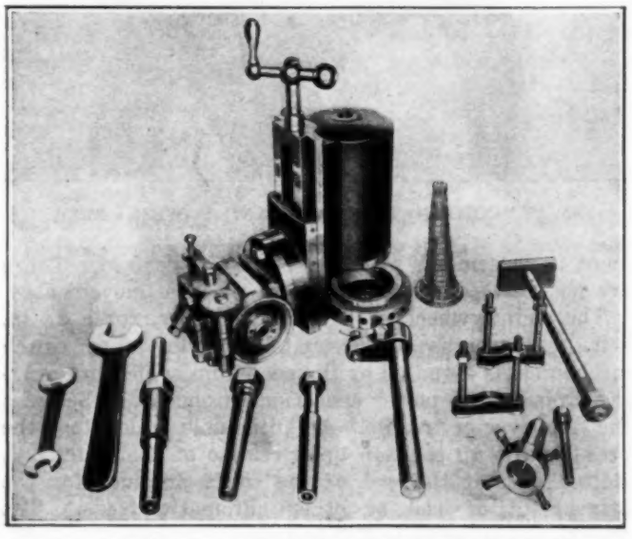
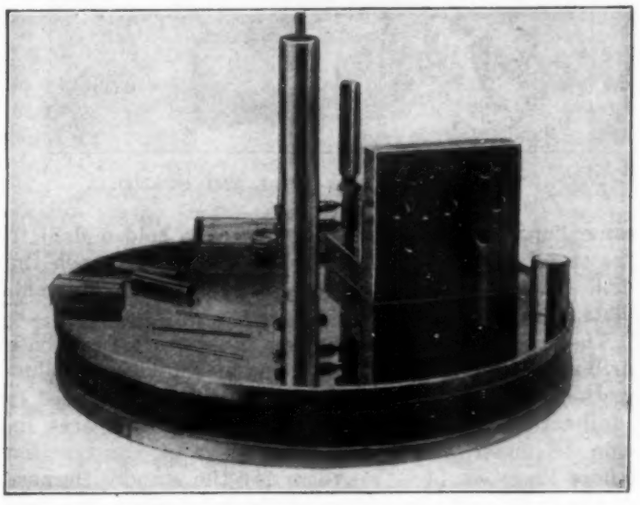


FIG. 2—PARTS OF "MILLERETTE" ATTACHMENT

Van Keuren Hardened and Lapped Steel Surface Plates

The Van Keuren Co., 362 Cambridge St., Boston 34, Mass., has recently added to its line of measuring tools various sizes of hardened steel lapped precision surface plates. The accompanying illustration shows the highly finished mirror-like surface on a plate 10 in. in diameter, the reflections of the tools and the work placed on the plate being very evident. The plate is suitable for general use, as well as in the toolroom.

The lapped steel surface plates are stated to have a degree of precision far in advance of hand-scraped cast-iron surface plates. They are free from the numerous hills and valleys arising from hand scraping. They are tested for planeness during manufacture by light waves. The plates are made in diameters of 5, 8 and 10 in. They are furnished with two handles which screw into the edges of the plate. A wooden box is furnished to protect the surface when the plate is not in use.



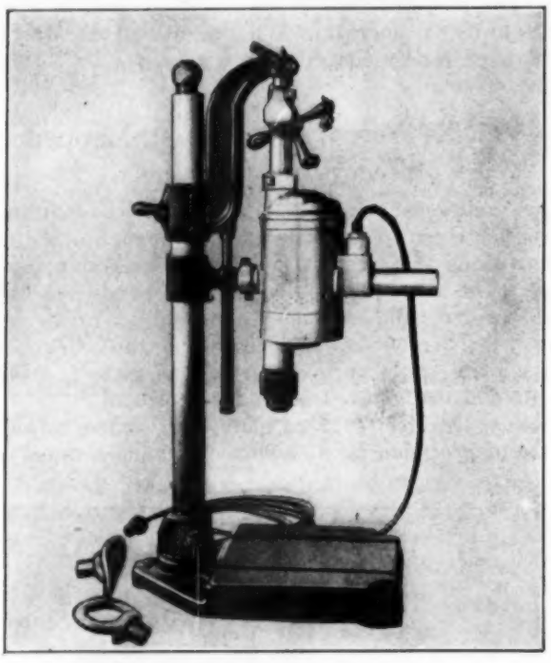
VAN KEUREN LAPPED STEEL SURFACE PLATES

For such work as the inspection of small parts by passing them between a dial gage and a surface plate, for sine bar set-ups and for measuring work where precision gage blocks are used, the lapped surface plates have advantages over hand-scraped surfaces. Gage blocks may be wrung directly on the surface plate, and the hardened steel surface wears much longer than the cast-iron surface on the usual style of surface plate.

"Way" Portable Electric Drill and Bench Stand

The A. F. Way Co., Hartford, Conn., has just placed on the market a portable electric drill to be used in connection with a portable stand by means of which the tool can be converted into a bench or floor drilling machine.

The drill, which is a complete tool without the stand, may be used as a hand tool wherever the use of such a drill is required. The breast-plate and handle that may be seen in the accompanying illustration at the foot of the machine are instantly attachable to the drill by the



"WAY" PORTABLE DRILL AND STAND

same "union" couplings as are used to hold a drill to the stand. No tools are needed to attach or detach the drill from the stand and place the handle and breast-plate in position.

The screw feeding mechanism is separate from both drill and stand, and may be used as indicated in the illustration, or may be left attached to the drill and used in conjunction with an "old man" in restricted spaces inside or under a machine in process of construction where there would be no room for the stand. Because of the right-angle mounting of the hand wheel, the feed may be used in very close quarters.

The motor, which is especially built for this tool, is of the universal type, running upon either direct or alternating current, and can be furnished for 110 or 220 volts. The motor frame and casing are of aluminum. An ample circulation of air is provided.

When mounted upon the stand the maximum distance from the chuck to the base is 14 in., and there is a quick vertical adjustment of 6 in. The machine will drill to the center of a 10-in. circle. The weight of the combined drill and stand is approximately 115 lb., and the weight of the drill separately is 21½ lb. The capacity of the chuck is ½ in. and the motor is stated to have ample power to drive a ½-in. drill in steel without overheating. All gears are of high-grade steel and heat-treated. The bearings are of bronze.

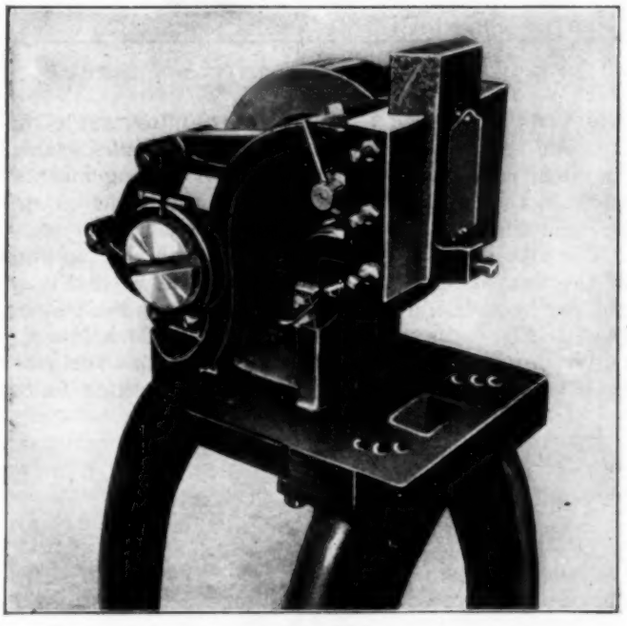
"Way" Combination Foot and Power Punch Press

The accompanying illustration shows a small press that by the changing of a single bolt, an operation which can be performed in a moment with no other tool than a screwdriver, can be converted into either a foot or power press. The machine has recently been developed and placed on the market by the A. F. Way Co., Hartford, Conn.

As a foot press it is of the pendulum type, actuated by a swinging foot-lever, or pendulum, which is permanently attached to the machine. A positive stop limits the downward movement of the ram. Changing the position of the bolt by means of which the pendulum is attached to the upper lever converts the tool into a strongly driven power press, actuated by an eccentric and the toggle levers at the rear. The change can be quickly made so that the machine can be utilized in the shop for two classes of work.

The stroke of the press is 1 in. A 2½ in. square hole through the bed allows for the passage of blanks through the dies. A surface 5 by 12 in. in size is available for attaching dies.

The vertical adjustment of the ram is by means of hardened steel packing blocks above and below the rounded end of the actuating lever, behind the movable plate to be seen in front of the ram. There are several of these blocks of different thicknesses so that they may be arranged in different combinations to give adjust-



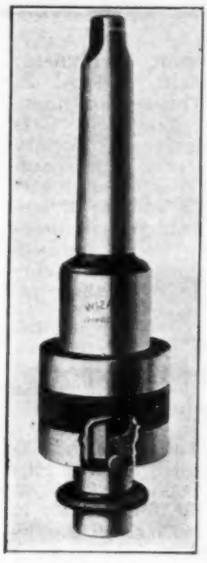
"WAY" COMBINATION FOOT AND POWER PRESS

ment in increments of ⅛ in. or less if desired. There are no screws under pressure in the ram movement.

The web flywheel is 12 in. in diameter, for a 2½ in. belt, and weighs approximately 65 lb. The clutch mechanism is actuated by the pendulum, which in changing from foot to power operation automatically becomes the trip lever or treadle. An adjustable brake stops the press in the up position upon release of the clutch. A slotted disk at the end of the shaft provides for the attachment of roll or other automatic feeds. The weight of the press is 325 pounds.

McCrosky Improved "Wizard" Quick-Change Collet Chuck

The McCrosky Tool Corporation, Meadville, Pa., has recently brought out an improved style of its "Wizard" quick-change collet chuck, the model being simpler and sturdier than the original one. The chuck consists of two main parts, one being a driving body having a Morse taper shank to fit the spindle of the drilling machine, and the other being a hardened slotted collar to hold the collet in the driving body.



McCROSKY IMPROVED "WIZARD" COLLET CHUCK

The accompanying illustration, in which the knurled collar is broken away, shows the bayonet locking slots in the collar that admit the driving lugs of the collet. The construction permits the operator to insert or release the collet with one hand without slowing or stopping the machine. Inserting the tool is accomplished by merely pushing the collet up into the revolving chuck, where the automatic latch instantly locks it.

Releasing the tool is brought about by pressing the knurled collar of the chuck so as to retard it, which action permits the collet to drop into the operator's hand. The chuck holds the same sizes and styles of collets that are employed with the former model.

Stewart Bearing Metal

The Stewart Manufacturing Corporation, 4535 Fullerton Ave., Chicago, Ill., has announced the development of metal for machine bearings. This Stewart bearing metal is an inseparable composition of copper and lead which can be remelted and cast any number of times under ordinary foundry conditions without segregation. The metal is especially adaptable for bearings where lubrication sometimes fails. Above 600 deg. F. the metal sweats lead and lubricates itself, and 1,700 deg. F. is the melting point.

On a segregation test, the metal was kept in a molten state 8 hours, cooled overnight and remelted in the morning. Three samples showed variation of less than 1½ per cent in copper content, it is stated. In a test where a 1⅞-in. shaft was run at a speed of 720 r.p.m. for one hour without any lubrication whatever, the temperature of the metal was raised to 1,000 deg. F. without scoring the shaft. Brasses made of the metal are claimed to have been in operation for three months in railroad service, where the ordinary brasses usually last from two hours to two weeks of service.

Stewart bearing metal is made in four degrees of hardness, to suit all operations and requirements. Grades B, C, D and E vary in Brinell hardness from 25 to 80, the latter being intended for heavy service. Standard bushings of the metal are made in 316 sizes, this range being calculated to meet nearly all ordinary requirements.

The metal is furnished in the form of tubes, which are finished all over and made in 13-in. length instead of the usual 12-in. length. It is claimed that this method reduces the waste very materially, because no machining need be done on the inside and outside as with the ordinary rough tube, and in general less waste results when cutting bushings whose lengths are integers of inches from a 13-in. tube than from a 12-in. tube.

Forbes & Myers Model 75 Electric Tool Grinder

Forbes & Myers, 172 Union St., Worcester, Mass., have recently placed on the market the Model 75 electric-driven tool grinder. The machine is similar in all respects to the Model 76 machine described on page 980, Vol. 56 of *American Machinist*, except for the fact that it is intended for single-phase current, while the Model 76 grinder utilizes multi-phase current.

The chief feature in the design of the grinder is that the motor has all the windings on the back side, and the front of the housing is flat. Thus, with the 6-in. wheels that are mounted on the motor shaft, three-fourths of a wheel can be worn away before the face is even with the front of the motor. The arrangement of the motor, guards, tool rests, ball bearings for the spindle and such points is the same as previously described for the Model 76 machine. If desired, the machine can be equipped with a cord and plug so that it can be operated from an ordinary lighting socket.

Two Gentle Reminders for Punctuality

BY FRANK V. FAULHABER

The plant that has experienced difficulty in getting its employees in on time might well consider the example set by one factory, which impresses the importance of punctuality upon its men from the very beginning of their employment. In the first pay envelope a man receives there is included a small card, with the printed motto: "Punctuality expresses earnestness of endeavor." If the new man's time card has indicated good time, there is added the encouragement in handwriting, "Keep it up!"

The new man who receives such encouragement will usually be impelled to report on time as often as possible, while to the man whose card signifies he is somewhat tardy there is thus provided a reminder that cannot but help get in its good work. The plant keeps close tab on the men's time reports and it has found that some of the tardy individuals are inclined to go out later than the others.

The executives realize, however, that it is wisest to get the men to come in on time, to go out on time, and thus to make for uninterrupted production. To those employees who seem to err there are given cards, via the pay envelope, with the suggestion: "A few early minutes are of more value than a few late ones." These two enclosures have worked wonders for the plant, bringing about better punctuality and willingly than might result from strict rulings.

There is an additional value to a brief notice in the pay envelope. It indicates to a man that he is a unit of notice rather than an overlooked cog in the plant. To the punctual employee it offers a word of appreciation, which is always welcome. The tardy employee cannot fail to realize that there is a warning, however slight, to buck up on time.

News Section

Plans Power Exposition and A.S.M.E. Convention

The National Exposition of Power and Mechanical Engineering to be held at the Grand Central Palace in New York from Thursday, Dec. 7 to Dec. 13, closing however on the intervening Sunday, is being planned in cooperation with the national societies interested in the economy of fuel and in the production and use of power generated therefrom.

The opening of the exposition in the Grand Central Palace will take place on the closing day of the annual meeting of the American Society of Mechanical Engineers, and time has been set aside in the A.S.M.E. program so that members desiring may attend the opening exercises.

In addition, the A.S.M.E. professional divisions on aeronautics, ordnance, and forests products will hold sessions of general interest to the engineering profession.

The American Society of Refrigerating Engineers is to hold its meeting at the Hotel Astor for three days commencing Dec. 5, and its members, as well as the members of the A.S.M.E. will be admitted to the exposition upon the presentation of their membership cards.

The exposition is fortunate in having an advisory committee that understands the importance of a greater popular appreciation of the engineering problems involved in the production and use of power. The committee is made up of Irving E. Moultrop, of the Edison Electric Illuminating Co. of Boston, chairman; Dexter S. Kimball, president of the American Society of Mechanical Engineers; Alexander G. Christie, chairman, power division, A.S.M.E.; Fred Felderman, national president, National Association of Stationary Engineers; Milan R. Bump, president, National Electric Light Association; N. A. Carle, vice president, Public Service Production Co. of New Jersey; E. B. Katte, chief engineer, electric traction, N.Y.C.R.R. Co.; Fred R. Low, editor, *Power;* David Moffet Myers, consulting engineer; Calvin W. Rice, secretary, American Society of Mechanical Engineers; and the managers, Charles F. Roth and Fred W. Payne, with offices in Grand Central Palace.

New A.S.M.E. Section Formed in Massachusetts

The newly formed Western Massachusetts section of the American Society of Mechanical Engineers has chosen as its chairman Charles L. Newcomb, works manager of the Worthington Pump & Machinery Co., Holyoke, and as its vice-chairman, George E. Williamson, executive engineer of the Strathmore Paper Co., Mittineague and Woronoco. The executive committee comprises A. L. Bausman, Springfield; F. O. Wells, Greenfield, and A. F. Blaisdell, Pittsfield. This section starts with a membership of about 200. It is affiliated with the Engineering Society of Western Massachusetts, representative of different branches of engineering, and out of which a number of sections or chapters of national engineering organizations are being formed, that members may become more closely in touch with the leaders in their respective engineering lines.

August Implement Exports Reach High Mark

Exports of agricultural implements from the United States during the month of August were valued at $3,352,657. This is the first month in which exports of agricultural implements have reached the $3,000,000 mark since July, 1921, and the value is the highest figure attained since April, 1921, in which month the exports in this line amounted to a value of $4,081,333. During the three succeeding months, viz., May, June, and July, 1921, exports of implements were $3,275,126, $3,262,641, and $3,266,860, respectively, but in no case did they equal those for August of this year. After July, 1921, exports of agricultural implements dropped very rapidly, going considerably below $1,000,000 in both November and December of that year.

Exports for August, 1922, exceed those for the same month in 1921 by $1,294,258. This is interesting, not only as showing an improvement in the demand for American implements abroad, but also because it is the first month since February, 1921, when the exports for any month have been greater than those for the corresponding month in the preceding year.

Esthonians Interested in American Machinery

Consul Albrecht, Reval, reports to the Department of Commerce that machinery and other products obtained from Germany at present are reported as being very frequently of inferior quality. Furthermore, it is stated that no assurances can be obtained as to price or time of delivery with reference to such goods, which generally are received at a much later period and cost considerably more than anticipated.

Indications are, the consul says, that American manufacturers might do business here with the local factories if the latter had fuller information as to their products, prices, terms of sale, and time required for delivery.

Except for one wood-working factory which placed important orders for American machinery as a result of a business trip of their representative in the United States, it is believed that none of the larger factories have ordered any machinery from America.

Ten Years' Progress in Management

As a part of the program of "Management Week" the American Society of Mechanical Engineers, the Society of Industrial Engineers and the Taylor Society held a joint meeting on Oct. 17 at the Engineering Societies Building. The title of the paper for the evening was "Ten Years' Progress in Management." It was received with a great deal of interest on the part of the large gathering and several engineers of note contributed to the discussion.

There was a distinct *American Machinist* flavor to the meeting inasmuch as the speaker, L. P. Alford, and the presiding officer, Fred J. Miller, both are ex-editors of this paper.

The object of Mr. Alford's paper was to report on the progress of management that has been made since the report of 1912, by a committee on the state of the art of industrial management at that time.

Among those who took part in the discussion were Myron H. Clark, of the U. S. Rubber Co.; Frank B. Gilbreth, of Frank B. Gilbreth, Inc.; John H. Williams, of Day & Zimmermann; Prof. Jos. W. Roe, New York University; and C. E. Knoeppel, of C. E. Knoeppel Co., Inc. Professor Roe read an English paper outlining the progress of management in that country and Mr. Knoeppel read abstracts from a German paper, showing the point of view of the Germans in regard to the development of management in that country and in the United States.

Dr. Stratton Elected to Head M.I.T.

Dr. Samuel Wesley Stratton, for twenty-one years director of the Bureau of Standards at Washington, was elected president of the Massachusetts Institute of Technology last week. He will assume the position on Jan. 1.

Dr. Stratton was born in Litchfield, Ill., in 1861, and was graduated in 1884 from the University of Illinois, where he later become professor of physics and electrical engineering. From 1892 to 1901 he was with the physics department of the University of Chicago.

Flinn Heads Engineers

Election of Alfred D. Flinn as Director of the Engineering Foundation, which is fostering organized industrial research on a nation-wide scale, was announced last week by Charles F. Rand, Chairman of the foundation. Mr. Flinn is the first incumbent of the new post, created by the foundation's Governing Board, composed of the Four Founder Societies of civil, mining, mechanical and electrical engineers.

He has been identified with municipal engineering enterprises in New York and Boston and was formerly a lecturer in Lawrence Scientific School of Harvard University.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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PRESIDENT HARDING, in his letter to Representative Mondell, published last week, said that "the national fiscal policy has been directed to arrest the rapid deflation which had set in" and that the business outlook is brighter "than at any time since the mistaken program of drastic deflation was adopted by those then in control of the government."

These statements read in connection with the reports from Washington that the President will not reappoint the man who was at the head of the Federal Reserve Board when the "mistaken program of drastic deflation was adopted" have been construed to mean that the Administration will not for the present oppose or attempt to check the credit expansion now in progress.

The logical result has been a continued advance in most commodity markets. Wheat is now about 15 cents above the lowest price recently recorded. Cotton has risen to the highest figure of the year. Rubber has sold at 23¾ cents, which is nearly 10 cents above the value when I first called attention to its subnormal cheapness in these letters. Sugar is up half a cent a pound, with every prospect of advancing further when the Cuban loan is arranged. Wool is firm and higher all over the world. So are silk, hides, leather, iron, steel, tin, tobacco and most basic commodities.

There has been a seasonal slackening in the demand for gasoline, as well as for lumber, brick and other building materials, copper still reflects Europe's inability to buy freely and a severe decline threatens a heavily overstocked egg market, but these are the only important exceptions to an upward tendency that is noticeable in nearly every department of domestic trade. That it is likely to continue is to be inferred from the fact that there has been no anticipatory buying as yet. Merchants are still cautious. Stocks are light. They have to be continually replenished and replacement orders are a sustaining and stimulating influence.

But notwithstanding the buoyancy of the commercial markets generally, bonds, including all Libertys, except the 3½s, are lower and the stock market has become spotted and irregular despite the fact that the 500 million Government bonds offered at 4¼ per cent were three times oversubscribed and the continued declaration of stock dividends by the Standard Oil companies and several other corporations that have taken similar action.

The money market meantime continues to harden and the gradual absorption of floating capital is indicated by higher rates for both call and time loans.

These developments all reflect what is called inflation by some and prosperity by others, but whatever it is called I see no reason to change my prognosis of last week, which was for a further and extended rise in commodity prices and a period of liquidation in most bonds and stocks except those of the railroad companies whose earnings will be increased by the activity of business.

I am not shaken in this view by the factitious activity of some of the highly speculative oil stocks and I am confirmed in it by Henry Ford's announcement that he has made a cut of about $50 in the price of all his cars. This may mean a war in the automobile trade that only the fittest will survive.

> **The graphic chart of business movement appears to indicate that a critical stage has been reached in the recovery from the depression of 1920-1921. Disturbing factors are beginning to appear. Rivalry to secure labor and materials is rapidly bidding up prices on commodities and wages. The situation calls for clear thinking to avoid disaster. Distinction must be made between an expansion resulting from steady, healthy growth and that sort of expansion which results from temporary hysteria and eagerness to reap big and quick profits.**

The automobile securities now listed on the New York Stock Exchange and the Curb represent values that run into the billions and any serious reduction in the profits of the motor trade is sure to be reflected by a decline in the motor stocks.

The incident is an apt illustration of the way in which markets that are "over bulled" may receive a blow from an unexpected quarter.

The other news of the week is not especially significant. The coal problem is being well handled. Production is large and the distribution is being fairly controlled. An acute shortage anywhere seems unlikely, but economy and forbearance will be necessary. The railway congestion is unrelieved and the steel industry is somewhat hampered by it.

The weekly statement of the Federal Reserve System shows a reduction of ½ of one per cent in the reserve ratio, which now stands at 75.2. Rediscounts show a gain of $24,000,000, as might have been expected from the increased activity at rising prices in the commodity markets. The gold on hand shows a reduction of $3,000,000, which is probably due to the efforts that are being made to put "yellow backs" into circulation.

Great Britain has paid $50,000,000 on account of the interest due on her debt to our Government.

Secretary Hoover's speech at Toledo has attracted much attention. In his opposition to the suggestion that we should forgive any substantial portion of the debt due us by the other Allies it is assumed that he spoke for the President.

The political fight in which Lloyd George is engaged is watched with much interest here, but its issue is not likely to have any immediate effect upon business in this country.

Economic conditions in Europe seem to be improved and sterling exchange advanced early in the week, although it weakened when the British Cabinet resigned.

Francs are lower and marks show no rallying power as the printing press continues to turn them out at the rate of about five or six billion a day. The total amount outstanding Oct. 14 is put at 375 billions, but the figures have ceased to be significant. It is reported that the German government will shortly issue gold notes or certificates against the 1,005,000,000 gold marks held by the Reichsbank and that these will be used to buy up paper marks at about present prices.

This is the policy followed by our own United States government during the Civil War when both gold and paper money were in circulation. It might work if Germany's credit was good enough to enable her to draw additional gold, but 1,005,000,000 marks, equal to only about $240,000,000, won't go very far and it is to be feared that the new currency if issued will be hoarded and soon disappear.

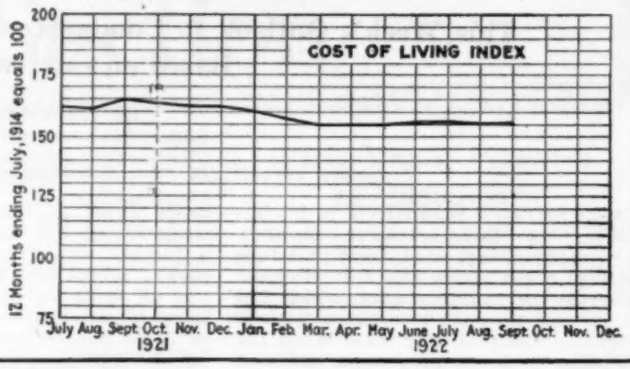
Conditions in Russia are rapidly mending if the news from there is to be credited, and in the Balkans and the nearer East there is an unusual approach to comparative tranquility. In Latin America also the outlook seems to be improving and the shares of the Argentine railways have advanced quite sharply in London upon the prosperity reported in the country they serve.

A higher barometer and clearing weather is in fact reported from all over the world and for the present at least the trade winds are favorable and it seems safe to carry a fair spread of canvas in foreign as well as domestic waters.

Replies received from a questionnaire recently sent out by the American Manufacturers Export Association to a large number of firms engaged in foreign trade carry a distinct note of optimism, and indicate a general increase in the size and number of orders from abroad.

Unfilled orders of U. S. Steel Corporation based on the monthly reports showing the forward tonnage on the books at the end of each month.

Index of the Cost of Living based on weighted retail prices collected monthly and compiled by the National Industrial Conference Board.



UNFILLED ORDERS on the books of the U. S. Steel Corporation on September 30, 1922, totaled 6,691,607 tons, as compared with 5,950,105 tons on August 31, of the current year. The September figure represents the highest point reached since February, 1921. This increase in tonnage over August, amounting to 741,502 tons is the largest increase recorded for any single month of the current year. The great demand for fabricated steel for construction purposes, coupled with heavy railroad buying accounts in a large measure for the increase.

Cost of living among wage earners' families in the United States on September 15 was 55.6 per cent higher than in July 1914, according to figures collected by the National Industrial Conference Board. Between August 15 and September 15 there was an increase of seven-tenths of one per cent. The changes in the budget within the month were slight increases in both clothing and food prices and a continued increase in fuel prices resulting from an unstabilized coal market. As compared with the high point reached in July, 1920, figures for September, 1922 represent a drop of 48.9 points or 23.9 per cent.

Metal product share markets, in keeping with industrial issues generally, held up well during September, the average price of ten representative issues being $77.23 per share as compared with $75.65 in August.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0295	$0.0285	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0373	0.0379
Brass rods.....	per lb.....	0.171	0.1700	0.148
Solder (½ and ½)	per lb.....	0.23	0.228	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	5.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.575	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

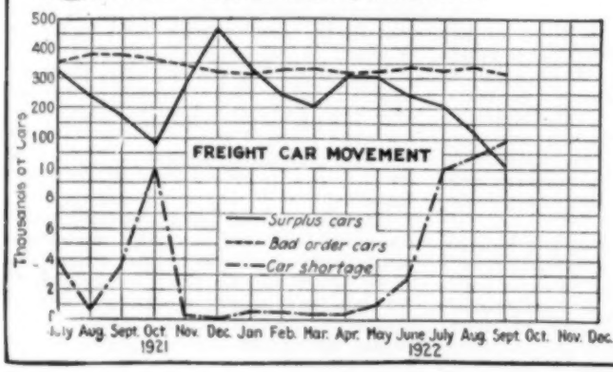
The agricultural implement industry shows marked improvement with an encouraging export demand. Electrical companies have, within the past three months, booked a very large volume of business, and a general betterment is reported in other issues.

Railroad rolling stock condition at the movement is the center of considerable attention and no little concern. The car shortage for the weekly period which began on August 23 and ended on August 31 was reported as 58,670 for American roads. By September 30, the shortage had reached 138,170 cars. The average for each weekly period of September amounts to about 100,000 cars. Car surplusage shows a corresponding decline from 70,455 cars on August 31 to 6,593 cars on September 30, an average for the month of about 21,000. Cars in bad order have decreased. On September 1, the total freight cars of all classes reported in need of repairs numbered 321,674 or 14.1 per cent of the total on line. By October 1, this class of cars had fallen to 291,654 or 12.8 per cent of the total.

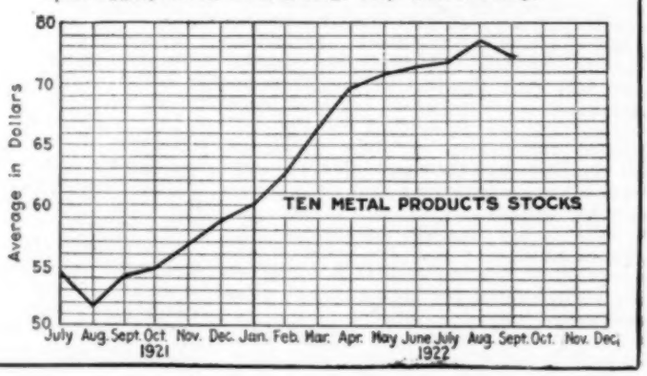
Reserve ratio of the Federal Reserve system for the week ending October 18 amounted to 75.2 per cent as compared with 75.7 per cent in the week previous. The Bank of England in the same period reports a ratio of 19.93 per cent, 19.97 per cent being the year's high point.

American foreign trade for September shows exports valued at $317,000,000 as compared with August of $301,804,618. Imports total $232,000,000 as against August total of $281,411,705, an excess of exports of $85,000,000.

Monthly average of car shortage, surplus and bad order cars in the United States based on returns to the car service division of the American Railway Association.



Monthly average: Ad. Rumely; Allis-Chalmers; American Can.; Cont. Can; Gen. Elec.; Int. Harv.; Nat. Acme; Und. Type.; West. Elec. & Mfg. Co.; Worth. Pump.



S.I.E. Annual Convention

Beginning with registration on Wednesday morning October 18th, the Society of Industrial Engineers, at its ninth Annual Convention, carried through a large and important program that was concluded by the Friday evening meeting devoted to the subject of materials handling. In connection there was held an equipment exhibition at which machinery of various types, particularly interesting to managers, was shown.

Officers elected for the coming year were: President, Joseph W. Roe, head of the department of Industrial Engineering, New York University; treasurer, F. C. Schwedtman, vice-president, National City Bank, and George C. Dent to the office of secretary and business manager.

The subject of the entire convention was "Economic Industry—Fundamentals Necessary to Obtain Maximum Production with Minimum Waste of Effort and Cost." The individual subjects taken up were: Relation of Economics to Industry, Economics part in the Formation of a Policy of Business Administration. The Economic Background Necessary for a Business Executive, The Relation of Fatigue Elimination to Other Activities, The Budget and the Financial Forecast, The Importance of the Elimination of Waste to the Economic Structure, How Can We Reduce Production Costs? What Keeps Workers Contented? The Relation of the Economists to Business, Finance and Industrial Economics, The Measurement of Management, Industrial Accounting, Reducing Sales Costs, The Scientific Selection of People for Jobs, Economic Aspects of production, and Materials Handling.

Tests for Applicants

The Industrial Relations Division, under the chairmanship of Earl B. Morgan, Manager of the Employment and Service Department of the Curtis Publishing Company, had an extremely interesting session. Mr. Morgan pointed out the value of having a pleasant stage setting for interviewing applicants for positions. By putting the prospective employee at ease and treating them courteously, you can find out much more readily if they are the kind you can use to best advantage. Many a concern makes innumerable enemies by ill treating applicants for positions and this frequently reflects on the business in unexpected ways. Courteous treatment on the other hand makes a friend of the applicant even if there is no position for them. And firms with the reputation of fair treatment get the best employees, for the best employees pick employers as well as employers picking the employees.

Mr. Morgan is much more impressed with practical tests than with written examinations. Standard questions are soon learned by floaters and these, most undesirable workers frequently pass such tests higher than the men you want. He also decried the idea that there should not be honest and healthy competition for employees as well as for business. If a man is worth more to you than his present employer is paying him, both you and the man have a perfect right to get together.

Miss Louise Moore, Employment Director for the Dutchess Mfg. Company of Poughkeepsie, brought out a number of interesting points such as the desirability of watching the kind of people who work well together. One class in her vicinity is very rapid but not quite so accurate as another class which is less speedy. She finds good results in mixing these classes in different departments rather than having either predominate in any one place.

In the same way great care should be taken in sending workers to different foremen. Certain kinds of foremen get along best with men of one type, other foremen prefer entirely different kinds of men. In the past much stress has been laid on preventing labor turnover, which is of course very expensive. And yet it is even more important to get the different people sorted into their proper jobs, where they can develop if possible and where they can earn the most for the company and for themselves.

Several means of reducing production costs and keeping workers content were described by Messrs. J. A. Faust, Wm. Geiger, Chas. Cheney and O. L. Prible on Thursday afternoon. Perhaps the most strongly emphasized factor was the disastrous effect of cutting prices. Discussion on this point brought out the fact that the sentiment against this practice was unanimous.

Frederick E. Rein of Philadelphia speaking of the measurement of management showed conclusively how measurement was accomplished in the dairy industry. The discussion that followed indicated that there is considerable hope that some day there will be established a unit which will permit the measurement of management, and production as well, in all industries. There was no claim made that any such unit has been discovered but the conclusions expressed indicated that many are thinking along that line. It was recognized that the difficulties of measuring management are many when compared with the difficulties of measuring the accomplishments of individual workers. Suggestions were made that it would be advisable to give more attention to the measurement of the efficiency of supervision and indirect labor.

At the Friday afternoon session Ernest F. DuBrul, General Manager of the National Machine Tool Builders' Association, gave one of his clear expositions of economic fact and theory which have made him so popular a convention speaker. Among other things he brought out the difference between the demand catered to by manufacturers of consumer goods and that supplied by makers of producer goods such as machinery. The other speaker was Dr. Arthur J. Todd, Director of Labor, B. Kuppenheimer & Company, Chicago whose topic was "The Industrial Age."

Dr. Richards Inaugurated President of Lehigh

Before an audience of delegates from other colleges, alumni and undergraduates of Lehigh and friends of the University which crowded the spacious Packer Memorial Chapel, Dr. Charles Russ Richards, former Dean of the College of Engineering of the University of Illinois, was inaugurated president of Lehigh University, at its annual Founder's Day celebration held in Bethlehem, Saturday, October 14.

Implement Makers Discuss Railroad Situation

Enactment of a law placing railroad employees in a preferred class, with wages fixed periodically upon a slightly higher basis than those paid in other industries, but predicating the passage of such a measure upon making railroad strikes a felony and upon granting to the railroads a fixed rate of return upon their property values were among recommendations for a possible solution of the carriers' difficulties, made last week by W. H. Stackhouse of Davenport, Iowa, speaking at the twenty-ninth annual convention of the National Association of Farm Equipment Manufacturers, in Chicago.

"Such a measure should effectively protect the country from a repetition of the disastrous strike through which it recently passed, and usher in an era of comparative tranquility in so far as the nation's railroad transportation industry is concerned," Mr. Stackhouse maintained, especially "if employment would at all times be open to men and women of proper qualifications, regardless of their affiliation or non-affiliation with any organization whatever."

Speaking on "Industrial Freedom," he referred to the situations in the coal and railroad industries, pointing out the peril to the public in the use of force in industrial disputes and in the "dangerous method of securing special privilege through the medium of group legislation," under threats of political extinction.

The address of Mr. Stackhouse, the keynote speech of the convention, was received enthusiastically by the 461 delegates present and brought to a close one of the most successful conventions in the history of the association.

Other addresses during the convention were: The Transportation Problem of 1922, by C. H. Markham, president, Illinois Central R.R.; Our Mutual Problems, by R. H. Lathrop, president, National Federation Implement Dealers' Association; Rotation in Trade, by Guy H. Hall, Chicago; European Conditions, by G. A. Ranney, International Harvester Co.; The Present and Future of the Implement Industry, by F. R. Todd, vice-president, Deere & Co.; Depreciation by T. F. Wharton, Deere & Co.; The Implement Trade Press, by L. C. Pryor, editor, *Farm Implements and Tractors;* Simplified Practice in the Implement Industry, by Wm. A. Durgin, Department of Commerce; The Dealer as an Asset, by Grant Wright, Eastern Federation of Implement Dealers; and, Agricultural Conditions in America Today, by James R. Howard, president of American Farm Bureau Federation.

Officers elected for the ensuing year were: President, J. B. Bartholomew, president, Avery Co., Peoria, Ill., and F. R. Todd, vice-president of Deere & Co., was elected executive chairman.

August Electrical Exports Show Slight Decline

Shipments of electrical equipment from the United States during August show a slight decline as compared with the previous two months, the decrease from the July total being approximately $300,000.

Death of John Bergone Foote

Those who attended the last convention of the American Gear Manufacturers Association can hardly realize that John Bergone Foote is no longer with us. He died suddenly Oct. 14, but four days after presiding as toastmaster at the A. G. M. A. dinner on the 10th. Born in Chicago in 1865 he attended the public schools until he was 14 and then went to work for the Chi-

cago Stamping Co. as a die setter. Following the metal stamping business he became foreman of the press and stamping room of the Cragin Manufacturing Co. at the age of 17, after which he turned his attention to lathe work, finishing the die and tool making trade when he was 21. From there he went to Norton Brothers which afterward became the American Can Co., as die and tool maker.

In 1887 and 1888 he was superintendent of the Cragin Manufacturing Co., leaving there to take charge of the machine shop of the American Can Company where he remained until 1893. He then became a designer and builder of special machinery for the Fisher Manufacturing Co., but the same year, 1893, entered a partnership with D. O. James to manufacture cut gears. A disastrous fire wiped out everything but the good will the next year and he then organized the Foote Bros. Gear and Machine Co. The building of that organization from a heap of ashes to a two million dollar concern was an achievement of which Mr. Foote was justly proud, and stands today as a fitting monument to his genius.

Ever since the organization of the American Gear Manufacturers Association, Mr. Foote was active in its behalf, being a director at the time of his death. His last work for the association was the preparation of a report on apprenticeship, in which he was deeply interested. In addition to his gear interests, he was also a director in the Barton Spider Web Re-Enforced Concrete System, President and Director of the Illinois Tractor Co., a member of the Society of Automotive Engineers, Illinois Athletic Club, the Oak Park Elks and treasurer of the Butterfield Country Club of Oak Park. He will be greatly missed, for he was always an active participant at all conventions.

Alabama Pig Iron Output Reaches Record

Pig iron production in the Alabama district, the Southern Metal Trades Association advises, is now on a basis of about 205,000 tons per month, the highest point in more than two years. It has increased steadily from month to month since the first of the year, and October melt will be the biggest month of 1922 to date. The outlook for 1923—the early part of it at least—is the brightest since the inflation period immediately following the World War when production was at the highest point in history all over the South. Furnace companies are well sold ahead and orders for early 1923 delivery are being received in far greater volume than up to this time in 1920 or 1921.

Prices also are continuing to climb steadily, some change having been noted each week for the past two months. Quotations are at $30 per ton for No. 2 foundry iron, though it is being purchased by the regular buyers at around $28.50. Quite a few sales at these prices have been made for 1923 delivery. No decline in prices is looked for in the immediate future.

The association also advises that iron and steel conditions are now generally better over the entire South than they have been in the past two and a half or three years, with the outlook giving promise of 1923 as a normal year. Furnaces are operating steadily outside the Alabama district with plenty of business to insure a steady activity.

Export business in iron and steel products out of southeastern ports also has been picking up considerably of late, and a considerable tonnage of miscellaneous products is going to Latin-America and to far eastern countries, principally machinery of various types.

Goodson Sees Great Opportunity Abroad

B. F. Goodson, president of the American Equipment Co., Detroit, Michigan, who recently returned from a tour through England and France, says that the industrial conditions there are in such a state that the manufacturers of the United States have an exceptional opportunity for capturing the foreign trade. He states that the labor element, which is very strong, has secured the passage of laws that provide for the payment of a weekly stipend to unemployed workmen, with the result that many of them only perform enough labor to retain their membership in the unions. Industry is practically paralyzed and conditions are growing worse instead of better. Mr. Goodson's statements are based on a study of conditions in the districts of London, Manchester, Birmingham and Paris, in each of which he spent some time.

Mr. Goodson also says that the German machine tool manufacturers are selling on terms of one-third c.o.d. and the balance to be paid in small payments extending over a period of two years. This is their bait to the South American countries and with which they expect to win trade away from the United States. Their prices are much lower than American prices and they are copying everything of value.

Business Items

The Skelton Shovel Co., Inc., Dunkirk, N. Y., is building a factory in that place to manufacture a complete line of solid shank one-piece shovels and expects to be in production by February, 1923.

The Traylor Engineering and Manufacturing Co., Allentown, Pa., has enlarged its plant in that city for the purpose of consolidating its truck and spring business.

The Peerless Machine Co.. Racine, Wis., has moved into new and larger quarters at 14th and Clark Streets, that city, in order to accommodate the expansion resulting from the sales of its universal shaping saw.

The Clayton Manufacturing Co., Bristol, Conn., manufacturer of steel shears, etc., has recently increased the capital stock of the concern from $100,000 to $150,000.

The Fisher Body Corporation will begin work in Janesville, Wis., on a building containing 96,000 square feet of floor space, for the construction of from 100 to 150 bodies daily.

The U. S. Government will construct at Hoboken the largest pier at any port in the United States for the accommodation of the giant liner Leviathan.

The Chevrolet Motors Co. will erect a one-story building at Janesville, Wis., for the assembly of its cars, the plant to be 500 by 125.

The Atlantic Coast Line Railway has awarded contracts for double-tracking from Bennett, S. C., to Doctortown, Ga. The company placed an order for 30,000 tons of steel rails.

Pollard Bros., Chicago, manufacturer of steel bench legs, benches of all kinds, bar stock racks, lawn and porch furniture, have outgrown their present quarters and are moving to larger quarters. Their new address will be 3670 Milwaukee Avenue, Chicago, Ill.

The Westinghouse Electric and Manufacturing Co. announces the transfer of the Krantz works, Brooklyn, N. Y., to Mansfield, Ohio.

The Ford Motor Co.'s new Green Island plant, according to an announcement from Albany, New York, is expected to be completed during October and ready for the installation of machinery.

The Bethlehem Steel Corporation will spend immediately $15,000,000 on its newly acquired Lackawanna Steel Co. plant in Buffalo.

The Mack Trucks, Inc., for the third quarter of the current year will show net earnings of $1,315,633 after taxes and charges, or $3.64 per share on the common stock after preferred dividends.

The Automatic and Electric Furnaces, Ltd., London, England, announces that owing to the increased demand for the Wild-Barfield Electric Hardening furnaces, it has been compelled to seek larger quarters and on and after Oct. 1, the company's new address will be: Automatic and Electric Furnaces, Ltd., Elecfurn Works, 173-175, Farringdon Road, London, E. C. 1.

The American Locomotive Co. is planning the erection at its Schenectady

plant a large shop for the construction of mechanical parts of locomotives and for packing engines for foreign shipment.

The Central Foundry Co. plant at Holt, Ala., known as Plant No. 3, was damaged by fire this month, the loss amounting to more than $50,000, largely covered by insurance.

The Fleming Machine Co., Springfield, Mass., is increasing the production of its new valve grinder, which is equipped with two motors, with size reduced to two square feet and weight to 100 pounds. The output is about to be increased to ten a day. Sales agencies are being appointed in every state and numerous foreign countries.

The Spartan Saw Works, Springfield, Mass., has filed plans for a new factory building in Fisk Avenue, to cost $14,000.

The Gilbert & Barker Manufacturing Co., West Springfield, Mass., continues to operate three eight-hour shifts a day, including Sunday, in all departments, and it is stated that orders are sufficient to assure this plan of operation for the rest of the year.

The L. S. Starrett Co., Athol, Mass., having sold the bulk of stocks accumulated at the beginning of the dull season, has advanced its production schedule to four days a week, this applying to all departments except the hack saw works, which run on full time.

The New Home Sewing Machine, Orange, Mass., has posted a notice of an increase in wages averaging about 10 per cent in the various departments.

The Southern Sheet Metal Co., organized recently with W. M. Blecker as president, is planning the establishment at Chattanooga, Tenn., of a steel mill consisting of an eight sheet plant, and three sixty ton open hearth furnaces. The estimated minimum capacity of the plant will be 55,000 tons per year. The company will be capitalized at $1,100,000, and W. J. Lynch, vice-president, is now in Chattanooga conferring with capitalists relative to the establishment of the plant.

The National Cast Iron Pipe Co., of Tarrant City, Ala., plans to remodel and enlarge its plant, the work to be carried out within the next few weeks. Considerable new machinery is to be installed in the shops.

The Brown Instrument Co., manufacturers of pyrometers and other recording devices used in industrial plants, announces that a southern district office has been established at Birmingham, Ala. The Birmingham office is in the Brown-Marx building, the district being under the management of Charles L. Saunders. An ample stock will be carried at Birmingham to supply the company's trade in the southern territory.

The Roane Iron Co., of Rockwood, Tenn., a few days ago suffered a loss of more than $100,000, when fire of unknown origin swept the plant. The loss was largely covered by insurance and the destroyed unit probably will be rebuilt before the end of the year.

The Precision and Thread Grinder Manufacturing Co., 1 South Twenty-first St., Philadelphia, Pa., manufacturer of the multi-graduated precision grinder, thread lead variators and permanent alignment wheel trueing heads, which was recently acquired by A. T. Doud, president of the company, announces the appointment of William H. Frick as chief engineer in charge of engineering, development and service departments. D. F. Bruce, formerly with the McCambridge Co., as superintendent, has been appointed superintendent in charge of manufacturing and production.

The General Electric Co. for the three months ending Sept. 30 reports that orders have been 42 per cent greater than for the corresponding three months in 1921, according to a statement to the stockholders made public by Gerard Swope, president.

The Pittsburgh Steel Co. and subsidiary companies for the fiscal year ended June 30, 1922, shows in its report a net income for the year of $861,833.28, after charging off for depreciation and depletion $866,000, reduction of inventory values $65,000 and including in operating costs $1,547,000 for maintenance, repairs and replacements.

The Moon Motor Car Co. has declared a quarterly dividend of 25 cents per share on its common stock payable Nov. 1.

The Austin-Western Road Machinery Co., Chicago, has absorbed the Wilson Tractor Manufacturing Co., Ottumwa, Iowa.

The General Piston Ring Co., Indianapolis, Ind., is the new name for the company formerly known as the Teetor Manufacturing Co.

The Hillman-Ayers Manufacturing Co. has been incorporated in Kansas City, Mo., with a capital of $5,000, to manufacture, deal in and with, gas generating oil burners of every description, furnaces, heaters, parts, devices, accessories, machinery, tools, apparatus, novelties, metal products, fabricated goods, materials and fuel. The incorporators are: J. P. Hillman, W. B. Laughlin, A. A. Hillman, all of Kansas City.

The Allis Chalmers Manufacturing Co. has declared its regular quarterly dividend of 1 per cent on the common stock, payable Nov. 1.

The Binghamton Foundry and Machine Co., Binghamton, N. Y., is the name of the new company resulting from a merger of the Shapley & Wells foundry and the plant of McGill & Holford, both of that city. The new company has a capitalization of $250,000.

The Hupp Motor Car Corporation has declared its regular quarterly dividend of 2½ per cent on the common stock payable Nov. 1.

The Bridgeport Motor Co., Inc., manufacturer of marine motors and reduction gear equipment, etc., Bridgeport, Conn., has recently been reorganized. Henry H. Brautigan, general manager of the factory since 1900, has been made president and general manager of the new concern, and R. S. Hanover, of New York City, has been chosen secretary. The new company will have a capital stock of $100,000, and one of the new policy features will be the standardization of its product.

The Republic Iron and Steel Co. reports for the quarter ended Sept. 30, a deficit of $138,676, after taxes and charges. This compares with net profits of $86,382 in the previous quarter and a deficit of $1,398,410 in the third quarter of 1921. Unfilled orders on hand as of Sept. 30, of finished and semi-finished products totaled 199,431 tons, against 196,886 tons on June 30, and 69,577 tons on Sept. 30, 1921.

R. G. Haskins Co., manufacturer of flexible shaft equipment and portable tools, will move into larger quarters November 1 at 516 W. Monroe St., Chicago, Ill., which will give them increased store space for the display and demonstration of their machines as well as larger facilities for handling the routine of their business. A display room will be maintained where machines can be tested out on a great variety of actual operations.

The Western Iron Stores Co., Milwaukee, Wis., of which John Camm is president and general manager, is making extensive alterations and improvements to afford display facilities for greatly increased exhibit of machine tools and shop supplies.

American Radiator Co. has declared an extra dividend of 50 per cent in common stock on the common stock payable Dec. 30, to stock of record Dec. 15.

The Auburn Brass Foundry, Cranston, R. I., has recently been established by Axel W. and William Bergman, at 258 Wellington Ave., Cranston, to engage in the brass founders business.

The Connecticut Industries Co., Bridgeport, Conn., has recently been incorporated under the laws of Connecticut, to engage in the general manufacturing business, etc., with a capital stock of $100,000. The incorporators include Edward J. Kelly, Fairfield, Conn.; C. H. Sheehan, Bridgeport; and David S. Day, 886 Main Street, Bridgeport.

The Union Plane Co., New Britain, Conn., has recently been incorporated under the laws of Connecticut, to manufacture and deal in planes, tools, hardware, etc. The capital stock is $50,000, and the incorporators are: A. F. Corbin, 99 Vine St.; H. H. Wheeler, 28 Forest St.; and C. S. Newman; all of New Britain. Officers chosen are: president, A. F. Corbin; vice-president, C. S. Newman; secretary and treasurer, H. H. Wheeler.

The French Manufacturing Co., manufacturer of small tubing, etc., Waterbury, Conn., during the past week filed a certificate with the Secretary of the State of Connecticut, increasing the capital stock of the concern from $100,000 to $400,000, issuing 3,000 additional shares at $100 par value.

Personals

W. A. CREIDER has recently become affiliated with the Federal Machinery Sales Co., Chicago, and will cover the Milwaukee territory.

FRANK FRISCH has taken over the Milwaukee and Wisconsin territory, in addition to the Chicago district for the Courtland emery wheel.

T. G. REMSEN, formerly of Hill-Clark Co., has recently joined the organization of the Federal Machinery Sales Co., Chicago, Ill.

LOUIS W. BYRNE, formerly with Burton Griffiths and Co., Ltd., New York

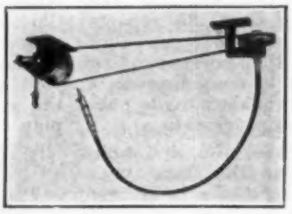
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Flexible Shaft Outfit, Type NK4S

Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn.

"American Machinist," August 31, 1922



The outfit is intended primarily for driving screws. It is arranged for over-head mounting, but can be secured to the bench or wall. When the screw-driver is employed in the vertical position, the bracket is ordinarily mounted on the ceiling, but for horizontal work it is mounted on the walls. The counter-shaft is equipped with tight and loose pulleys and with a lever-operated belt shifter. A ball bearing swivel connection can be furnished for high speeds. The style of flexible shaft and hand piece needed can be provided. The finder sleeve can be furnished to fit the screw that is being driven.

Sander, Disk, Portable, Motor-Driven, 9-Inch

Syracuse Sander Manufacturing Co., Inc., Syracuse, N. Y.

"American Machinist," September 7, 1922

The machine can be fitted with garnet paper disks for sanding wood and grinding brass and aluminum, as well as with emery cloth for iron and steel. It can be connected to any convenient light socket, being furnished with a motor to suit the type of current available. The disk is driven directly by a ½ hp. G.E. enclosed motor running at 1,725 r.p.m. and controlled by a tumbler switch. The table is equipped with a graduated angle gage. The head is mounted on a pedestal by a swivel joint. A canvas bag is attached to the table for catching the dust thrown from the disk. Table: size, 5½ x 10 in.; height, 38 in.; tilt, 45 deg. down, 15 deg. up.

Metal, Cutting, Non-Ferrous, "Diamond Alloy"

Kent-Owens Machine Co., Toledo, Ohio, maker;
P. H. Biggs, 1235 W. 9th St., Cleveland, Ohio, sales agent.

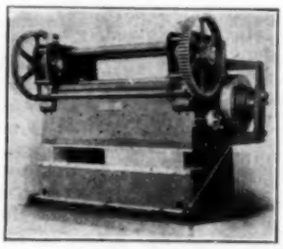
"American Machinist," September 7, 1922

The metal is composed of chromium, molybdenum and tungsten, producing a hard, fine-grained, homogeneous alloy. It possesses an unusual degree of resistance to wear, and heat resisting quality, and is also non-magnetic. It can be cast in permanent molds into milling cutters, end mills and reamers; and requires only a grinding operation but no heat treatment. It can be cast around a tough steel center, or can be welded to steel. The "Super" toolholder holds the gradually tapered shank of the cutter bits made of the metal. It is made in nine different sizes, the section ranging from ⅜ x ⅜ in. up to 1¼ x 2½ in. in size. With a single-point bit, the tool can be adapted as a right-hand, straight or left-hand tool.

Brake, Press, Power, All-Steel

Cincinnati Shaper Co., Cincinnati, Ohio

"American Machinist," September 14, 1922



The strength and ease of operation are the chief features. The steel plates used for the frame and large members are electric welded in fabricating and assembling. The machine is made in four main pieces and, with the drive shaft and cross brace, has six parts to be assembled. With the open-side housings, bends can be made near the edge of the plate, utilizing the full length of the die-holding surface. The machine operates at a greater number of strokes per minute than customary. The flywheel is mounted on high-duty ball bearings with hardened races. The clutch is of the multiple-disk type operating in oil. The brake is built in capacities of from 80 to 600 tons and for working material from 10 gage to ⅜ in. thick.

Broaching Machine, Hydraulic, High-Speed

Oilgear Co., Milwaukee, Wis.

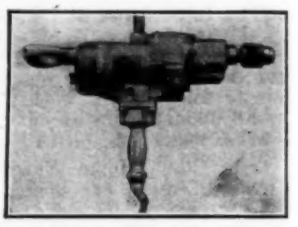
"American Machinist," September 7, 1922

A standard type-MD, variable-delivery pump delivers a steady flow of oil to a double-acting cylinder, whose piston rod is connected to a sliding head. The speed of piston travel can be changed by changing the pump stroke. The speed of the return stroke is adjustable independently of the cutting stroke. Automatic stops can be set for any desired length of stroke. Reverse is operated by a small push-button or by automatic control. The machine is driven by vertical belt from a lineshaft or by a motor. Pulling capacity, 16,000 lb. Speed range, 48 to 360 in. per minute. Stroke, 56 in. Motor, 10 hp. Floor space, 16 ft. x 26 in. Weight, 2,900 pounds.

Drill, Electric, Portable, Reversible, "Independent"

Independent Pneumatic Tool Co., Chicago, Ill.

"American Machinist," September 7, 1922

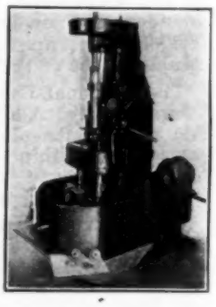


In the drill, the direction of motion is reversed mechanically. The reversing gear is equipped with a locking device which can be shifted to give three different motions. The locked constant forward motion is for drilling, reaming, stud driving, nut tightening and tube rolling; the locked constant reverse motion is for backing off nuts and backing out studs and tube rollers; and the neutral position allows the spindle to slip into the forward motion when the machine is pressed forward against the work and to slip into the reverse motion as the machine is withdrawn from the work. The reversing mechanism is adaptable to both electric and pneumatic tools.

Drilling Machine, Rotary-Table, Box-Column, 20-Inch

Rockford Drilling Machine Co., Rockford, Ill.

"American Machinist," September 7, 1922

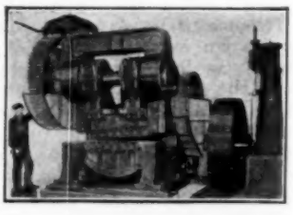


The upright drilling machine is especially fitted for multiple-operation work on small parts. It is driven through a silent chain from an electric motor. The speed is changed by interchangeable pick-off gears and four changes of feed are provided by means of a gear box. A four-station rotary table having an indexing plunger worked by a treadle is applied to the regular table, and is indexed by hand after the locating plunger is pulled out of position. The table carries four two-jaw chucks, which are aligned under three work spindles, so that three operations are performed simultaneously.

Shear, Plate, 48-Inch

Reading Iron Co., Scott Foundry Dept., Reading, Pa.

"American Machinist," September 14, 1922



This shear has the capacity for 1-in. steel plate 48 in. wide. It is arranged for either steam engine or electric motor drive. The 11-in. diameter camshaft is equipped with an automatic releasing clutch. This clutch can be used either for stopping at every upstroke, thus leaving the shear open for inserting the plate, or else the machine can be operated continuously, at the will of the operator. Weight, 55,000 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

City, has been appointed sales manager of the Wilmarth and Morman Co., Grand Rapids, Mich., manufacturer of grinding machines.

H. L. SEVIN, of T. L. Dodd and Co., has been transferred from Chicago to Detroit, Michigan.

H. A. BRUCE, formerly connected with Packard Motor Car Co., and long identified with the machine tool industry, will represent the E. L. Essley Machinery Co. in the Michigan territory.

F. E. GEORGE, assistant superintendent of the Donora plant of the American Steel and Wire Co., has been appointed superintendent of that company's Farrell works.

LORENZ MAISEL, formerly interested in the Madison Tool and Stamping Works, has been appointed factory manager of the Allan-Diffenbaugh Wrench and Tool Co., Baraboo, Wis.

C. B. BURNS, formerly with the Fairbanks Co., has become associated with the E. L. Essley Machinery Co. in the Chicago district.

FRED M. DEVLIN has been appointed president of the Philadelphia Foundrymen's Association to complete the unexpired term of his father, the late Thomas Devlin.

RALPH WIRTH, formerly of the Toledo Press and Machine Co., and the Niagara Machine and Tool Works, will represent the E. L. Essley Machinery Co. as a special representative in its sheet metal machinery department.

CHARLES W. WILSON has resigned as vice-president and general manager of the Willys-Overland Co., Toledo, and returned to his duties as president of the Wilson Foundry and Machine Co., Pontiac, Mich.

SHERMAN A. HARDING has been appointed manager of sales of the Consolidated Machine Tool Corporation for the Pittsburgh district, in which district he has been serving as sales representative of the Betts Machine Co. for the past three years.

T. P. NEILSON, for some time past identified with the machine tool trade, has become associated with the E. L. Essley Machinery Co., in the Chicago district.

J. RUFUS CASSELL is now advertising manager of the New York Blue Print Paper Co., New York, N. Y. Mr. Cassell was formerly an advertising specialist for The John Service, Inc., New York City, and previous to that was connected with the Thomas Elevator Co., Chicago, Ill., and the Advertising Service Department of the McGraw-Hill Co., Inc., with headquarters in Chicago, Ill.

CAPT. ANDREW T. GRAHAM, naval inspector of machinery at Newport News, Va., has been ordered to Camden, N. J., as naval inspector of machinery.

COMMANDER FLETCHER L. SHEFFIELD has been assigned to duty as naval inspector of machinery at Newport News.

WALTER L. MILLER has been promoted to the position of chief of the foreign service division of the Bureau of Foreign and Domestic Commerce by Secretary of Commerce Hoover. The task of promoting the growth of American foreign trade, as well as supervising the activities of Government commercial agents in all foreign fields, will be under Mr. Miller's direction.

Obituary

JOSEPH BLACKWELL, one of the founders and principal owners of the Enterprise Machine Works, Los Angeles, Calif., died in that city October 6, aged 67 years. He was a native of New Brunswick, Canada, but for the past 30 years had resided on the Pacific coast.

SPENCER F. MOORE, chief engineer of the Collins Co., manufacturer of edge tools, Collinsville, Conn., died at his home in that place October 11, following an illness of a week due to an infection. Mr. Moore was born in Schenectady, N. Y., and was 36-years of age. He was formerly with the Westinghouse Machine and Electrical Co., and the Terry Steam Turbine Co., of Hartford, Conn.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery and tools—Poland. Agency desired. Quotations, c. i. f. Danzig. Correspondence, German or French. Reference No. 3899.

Saw milling machinery—India. Purchase desired. Quotations, f. o. b. New York or San Francisco. Payment against documents. Reference No. 3921.

Machines for making soda straws—Canada. Purchase desired. Terms, cash. Reference No. 3951.

Machines for making pulp board pails—Canada. Purchase desired. Terms, cash. Reference No. 3954.

Apparatus for heating and pumping water to 50-room hotel—Cuba. Purchase desired. Quotations f.o.b. New York. Reference No. 3963.

Brick and tile machinery, architectural terra cotta machinery, and kilns for same—New Zealand. Purchase desired. Reference No. 3964.

Industrial transportation machinery, chemical plant equipment, structural steel, and boiler plant supplies.—Norway. Purchase desired. Quotations, f. o. b. New York or Philadelphia. Reference No. 3966.

Cotton boot and shoe lining cloths, of good weaves yet reasonably cheap, about 36 inches wide; also white shoe duck cloths in standard stock widths—Australia. Purchase and agency desired. Quotations, c. i. f. Sydney, Melbourne and Adelaide. Reference No. 3967.

One elevator for 50-room hotel—Cuba. Purchase desired. Quotations, f. o. b. New York. Reference No. 3968.

Tin plates of best quality—Italy. Agency desired. Quotations, c. i. f. Italian ports. Terms, cash. Reference No. 3970.

Woodworking machinery for small furniture manufacturers, such as circular saws, dimension saws, and benches for same, panel planers (buzzers), boring and sanding machines, disks sanders, cranking machines, band saws, spindle molders, etc., required by small furniture factories—Australia. Agency and purchase desired. Quotations, c. i. f. Port Adelaide. Terms, cash against documents. Reference No. 3975.

American raw cotton, cotton piece goods, cotton yarn, cotton waste, hardware, metals, sundries, etc.—India. Quotations, c. i. f. Bombay. Reference No. 3979.

Pipe fittings—Norway. Agency desired. Reference No. 3984.

Trade Catalogs

Inclinable Open Back Power Presses. The Niagara Machine and Tool Works, Buffalo, N. Y. This company has just issued a new publication, known as Bulletin No. 58, in which its complete line of inclinable open back presses are fully described with specifications and detailed illustrations.

Examples of Turning on the Lodge & Shipley Manufacturing Lathe. The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. A new publication of thirty-five pages has just been issued by this company which contains a study of problems in the economical and efficient production of small and medium sized parts. The forepart of the publication is given over to a detailed study of the company's manufacturing type of lathe with six carefully selected illustrations accompanying the description. Pages 10 to 30 are given over to detailed illustrations of lathe operations on various pieces of material both in the first and second stages of completion. The time required for each operation is set forth in each case. Pages 31 to 35 are given up to line drawings of various other kinds of parts with the time required for machining. The general arrangement of the publication is excellent, the photographs, line drawings and information showing clearly the possibilities of the company's manufacturing type of lathe.

Portable Electric Drills. The A. F. Way Co., Inc., Hartford, Conn. This company has just issued a folder setting forth the special features of the Way portable electric drill under the title, "Introducing a Way for Drilling."

Drill Presses. The Sigourney Tool Co., Hartford, Conn. This company has just issued a new catalog containing complete details of its line of plain bearing drill presses in one, two, three and four spindle types, as well as its bench type. The publication contains specifications on each type.

Thermit Locomotive Repairs.—The Metal and Thermit Corporation, New York, has issued the fourth edition of its Thermit Locomotive Pamphlet No. 21, which is of special interest to all railroad superintendents of motive power, general foremen, blacksmith foremen and thermit welders. The new pamphlet contains many revisions since the last edition was published, chief among which are instructions for applying important improvement in practice in Thermit welding which have been developed by exhaustive research. The drawings and instructions illustrating and describing making Thermit welds in various parts of locomotive frames and other locomotive and railroad equipment have been completely revised since the publication of the last edition to conform to the improved practice.

Forthcoming Meetings

American Manufacturers Export Association, annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Bucks Falls, Pa. (Delaware Water Gap).

Automotive Equipment Association. Annual show and meeting, November 13 to 18, Chicago, Ill.

National Founders' Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South LaSalle St., Chicago, Ill.

Eighteenth Annual Automobile Salon, Commodore Hotel, New York City, December 3 to 9, 1922.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922, Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Automobile Chamber of Commerce, National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Blue annealed steel sheets, base size, $2.50@$2.85 as against $2.50@$2.75 per 100 lb. f.o.b. Pittsburgh; black, No. 28, $3.35@$3.75 as compared with $3.35@$3.50, one week ago. Tin quoted in New York warehouses at 35c. as against 34¼c. per lb., last week. Discounts reduced two points on both black and galvanized wrought-steel pipe, on Pittsburgh basing card of Oct. 19.

Declines—Easier fuel situation reflected in downward trend of pig-iron prices. Structural shapes and mild steel bars quoted at an average price of $2 per 100 lb., Pittsburgh; small tonnages, however, still as high as $2.10@$2.15. Maximum on plates. $2.25 per 100 lb., f.o.b. mill.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	33.27
Southern Ohio No. 2	34.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	36.27
BIRMINGHAM	
No. 2 Foundry	27.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.64
Virginia No. 2	37.17
Basic	29.50
Grey Forge	32.00
CHICAGO	
No. 2 Foundry local	31.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	33.50
Basic	30.00
Bessemer	32.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cincinnati	9.0	6 0	5@5½
Cleveland	8.0	5.25	4 5
Chicago	6.0	5.0	4.0

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 50@2.85	4.19	3.70	4.00
No. 12	2.60@2.85	4.24	3.75	4.05
No. 14	2.70@2.90	4.29	3.80	4.10
No. 16	2.90@3.20	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.30	4.75
No. 28	3.35@3.75	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.75	4.90	4.40	4 85
Nos. 12 and 14.	3.45@3.85	5.00	4.50	4.95
Nos. 17 and 21.	3.75@4.15	5.30	4.80	....
Nos. 22 and 24.	3.90@4.30	5.45	4.95	5 40
No. 26	4 05@4.45	5.60	5.10	5.55
No. 28	4.35@4.75	5.90	5.40	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	¾ to 1½	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	64	53½	¾ to 1½	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	47%	57½%	45½%	62½%	48½%
2½ to 6 in. steel lap welded	57%	44%	55½%	42½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.82½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
½	8.00		12@13
⅛	6.50		11@12
1/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	14 75		
Tin, 5-ton lots, New York	35.00		
Lead (up to carlots), St. Louis 6.30; New York	6.75@6.87½		
Zinc (up to carlots), St. Louis 6.65; New York	7.37½		
Aluminum, 98 to 99% ingots, 1-15 ton lots	20.70	23.00	20.00
Antimony (Chinese), ton spot	7.25@7.37½	8.00	8.00
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	18.75	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	9.50	10.25	.....
Solder (½ and ½), (caselots)	25.50	23.50	20.00
Babbitt metal (83% tin)	34.00	44.00	36.00
Babbitt metal (35% tin)	25.00	17.25	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J .	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	12.00	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.25	4.75
Lead, tea	4.25	4.25	4.00
Brass, heavy	7.00	6.50	9.25
Brass, light	6.00	5.50	6 00
No. 1 yellow brass turnings	6.50	7.00	7.00
Zinc	3 00	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
	Coke Plates, Bright			
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
	Terne Plate			
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per b.	.065@.10	.09	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.93	1.01	.97
White lead, dry or in oil	100 lb. kegs.	New York,	12.75
Red lead, dry	100 lb. kegs.	New York,	9.65
Red lead, in oil	100 lb. kegs.	New York,	14.25
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	10.50@11.00	
Coke, prompt foundry, Connellsville	per net ton	12.00@12.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	5.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.35
Cone heads, ditto (net)	5.10	4.00	3.45
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55–5%	50%	50%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	40–5%	40½%	50%
Heavy grade	30–5%	30–5%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	65–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	1 24	1.40
Cloth	3.02	2 67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Chicago, Burlington & Quincy R.R., 547 West Jackson Blvd., L. N. Hopkins, Purch. Agt.—31 machine tools for Eola scrap reclamation yard near Aurora, Ill.

Ill., Decatur — Standard Mfg. Co., 422 City Title & Trust Bldg., (light generators, etc.)—spinning lathe, about 14 in. swing to spin 24 gauge sheet brass (used preferred).

Kan., Wichita—Biltwell Factories, 1414-17 South Washington St., (furniture manufacturers)—drill, press, lathe and other woodworking machinery.

Kan., Wichita—G. E. Osborn, 433 Wabash St.—small machine shop tools, grinder, wrenches, drill press, lathe and pulleys.

Ky., Somerset—Denton & Hamilton—16 to 18 in. shaper, Steptoe preferred (new or used).

La., New Orleans—The Cahn-Richards Tool & Supply Co., Inc., 709-711 Camp St., P. F. Richards, Vice-Pres.—lathes, drill presses, shapers, milling machines and all kinds of machinery.

Mass., Boston—Boston Sand & Gravel Co., 88 Broad St., P. F. Ayer, secy.—lathe, about 12 ft. long to take width of at least 20 in. (used).

Mich., Detroit—Dept. Purchases & Supplies, Marquette Bldg., G. J. Finn, Comr.—one portable motor driven cutting shear for Dept. Street Rys.

N. Y., Buffalo—D. Bunshaft, 55 Manchester Pl.—machinery, tools, etc., for proposed garage on Clinton St.

N. Y., Dunkirk—Leworthy Bros., Central Ave.—machinery, tools and mechanical equipment for garage and repair shop, to replace that which was destroyed by fire.

N. Y., Elmira—L. Clute, 215 Baldwin St.—machinery, tools and equipment for proposed garage and Ford service station at Horseheads.

O., Mansfield—The Ideal Electric & Mfg. Co.—24 in. shaper, milling machine and face grinder.

O., Spencer—Spencer Mfg. Co.—lathe, 3 drilling machines, 3 turret lathes, 2 milling machines.

Pa., Germantown (Phila. P. O.)—O. M. Dunn, Delmar and Morris Sts.—one power screw cutting machine.

Pa., Irvine—National Forge & Tool Co.—one 25 Colburn heavy duty drill press with compound table.

Pa., Pittsburgh—The National Tube Co., Frick Bldg.—10 or more heavy machine tools for Gary plant.

Pa., Pittsburgh—Pennsylvania R.R. Co., 1015 Pennsylvania Ave., W. G. Phelps, Purch. Agt.—receiving bids for 10 machine tools for Conway shops near Freedom.

Pa., Pittsburgh — Pittsburgh & Lake Erie R.R., South Smithfield St., C. M. Yohe, Purch. Agt.—90 in. wheel lathe, one 10 ton crane, four lathes, drill press, 24 in. shaper and grinder.

Pa., Scranton—J. Valverde, Walnut and Capouse St.—machinery and equipment for proposed $30,000 garage and repair shop.

Pa., Warren—R. Norris, c/o Warren Taxi Co.—repair shop equipment for proposed garage on Chestnut St.

Pa., Youngwood—The Robertshaw Mfg. Co.—equipment for proposed foundry and machine shop.

Va., Norfolk—The Virginian Ry. Co., T. Moore, Purch. Agt.—lathes and planers.

Va., Petersburg—American Spotless Co., 21 East Bank St., (manufacturer of street trash receptacles)—stamping machine for 20 gauge sheet iron.

Va., Petersburg—Andrews-Harris Boiler & Machine Co., A. Harris, Purch. Agt.—gear cutting attachment, Garvin head, also a 56 in. vertical boring machine.

Va., Petersburg—Blue Star Garage, 225 2nd St.—small lathe, drill press and cylinder grinder.

Va., Petersburg—The Crist Motor Co., 105 East Bank St.—small lathe.

Va., Petersburg—L. B. Curley, 426 Halifax St., (automobile repairs)—lathe and drill press.

Va., Petersburg—Lewis & Clayton, 116 West Bank St., E. M. Lewis, Purch. Agt.—electric drill.

Va., Petersburg—Peoples Motor Co., West Tabb St.—lathe and hand tools.

Va., Petersburg—Petersburg Fire Dept.—drill press, lathe and shaper.

Va., Petersburg—Smith & Temple, 27 and 37 East Bank St., (automobile repairs)—power press.

Va., Richmond—Auto Service Co., 1504 West Broad St., W. H. Wyatt, Purch. Agt.—lathe, drill press, emery grinding machine.

Wis., Ashford (Campbellsport P. O.)—J. Schill, (garage and repair shop)—automobile repair machinery, including drill press, gasoline storage tank and pump.

Wis., Chippewa Falls—The Chippewa Valley Auto Co., 16 River St., F. A. Bigler, Pres.,—power and automobile repair machinery for proposed garage.

Wis., Milwaukee—Bahde Mfg. Co., 2621 Vine St., (manufacturer of patented mechanical articles), C. A. H. Bahde, Purch. Agt.—one No. 2 milling machine, 3 drill presses, one 14 in. and one 16 in. lathe, and one 24 in. shaper.

Wis., Montfort—O. Yerke—automobile repair machinery for proposed garage and repair shop.

Wis., Rhinelander—The Wisconsin Regrinding Co., A. P. Schneidewind, Sheboygan Falls, Pres.—power machinery and one 18 x 96 in. crankshaft grinder for proposed machine shop, here.

Wis., West Allis (Milwaukee P. O.)—Highway Garage & Service Co., Hawley and Beloit Rds., W. G. Schenk, Purch. Agt.—repair machinery, including lathe and drill press.

N. S., Truro—H. Johnson—iron foundry and machine shop equipment.

Ont., Toronto—The Ford Motor Co. of Canada, 672 Dupont St.—machine shop equipment, lathes, etc., for proposed motor factory on Danforth Ave.

Machinery Wanted

Colo., Aurora—W. A. Heller—complete newspaper equipment.

Conn., Bridgeport—The Frisbie Pie Co., 363 Kossuth St.—equipment for proposed bakery at Hartford.

Conn., Bridgeport—The Huber Ice Cream Co., 800 Seaview Ave.—ice making machinery for proposed addition to plant.

D. C., Wash.—Bureau of Yards and Docks Navy Dept., will soon receive bids for refrigerating and ice making equipment for plant at hospital, Pearl Harbor, T. H.

D. C., Washington—Bureau of Yards and Docks, Navy Dept. will receive bids until Nov. 15 for coal and ash handling equipment for hospital at Tupper Lake, N. Y.

Fla., New Smyrna—The Volusia Cypress Co.—machinery and equipment for proposed saw mill, planing mill and lumber plant.

Ill., Chicago—Hines Lumber Co., 2431 Lincoln St.—saw mill machinery.

Ill., Lakewood — P. Robinson — shoe finisher, motor direct, belting and shafting.

Ind., Alexandria—Ziegler Mfg. Co., (manufacturer of screw machine products, etc.)—machinery and equipment for $20,000 addition to factory.

Ind., Logansport—The Logansport Radiator & Equipment Co., J. F. Diggin, Pres.—machinery and equipment for proposed addition to factory, to triple present capacity.

Kan., Eskridge—C. W. Walker—saw mill, saws and belting.

Me., Sanford—The Sanford Mills, Inc., (woolen mills)—machinery for 4 story, 80 x 150 ft. and 6 story, 80 x 150 ft. additions to plant.

Mass., Boston — Arlington Press Corp., 112 Castle St.—job press, Chandler & Price, preferred, 10 x 5 in. or 12 x 18 in. (used).

Mass., Boston—The Merrimack Clay Products Co., 185 Devonshire St.—equipment for proposed plant for the manufacture of clay and hollow tile products at Plaistow, N. H.

Mass., Caryville—Taft Woolen Co.—machinery for addition to picker house.

Mass., Fall River—Fyans, Fraser & Blackway, 83 Anawan St., (textile machinery)—one continuous dyeing machine.

Mass., Malden—Yale Knitting Co. (manufacturer of union suits)—machinery for addition to mill.

Mass., Milford—The Charlescraft Press, 43 Exchange St., J. E. Barnes, Mgr.—printing machinery and equipment.

Mich., Ann Arbor—Parker Electric Mills—machinery and equipment for proposed $700,000 flour mill at Somerset, Ky.

Mich., Detroit—The Chevrolet Motor Co., West Grand Blvd.—equipment for making and assembling automobiles, bodies, enameling tanks ,etc., for proposed factory at Buffalo.

Mich., Detroit—W. C. Dawson, 140 East Larned St.—complete equipment for woodworking machinery.

Mich., Detroit—The Pennsylvania R.R., 1368 Penobscot Bldg.—machine equipment for proposed engine house on 19th St.

Mich., Detroit—Ternstedt Mfg. Co., Artillery and Muster Aves.—miscellaneous machine equipment for addition to plant, for the manufacture and finishing of automobile hardware.

Minn., Bluffton—Bluffton Creamery Assn., H. G. Imdreke, Secy.—one 1,000 lb. churn, two 300 gal. cream ripeners, one 30 gal. starter can, one 24 bottle steam tester, one 30 gal. weigh can, one Torsion test scales, one wash sink, one 20 hp. horizontal boiler, one 15 hp. horizontal center crank engine and about 40 ft. of line shafting with hangers and pulleys.

Minn., Minneapolis—The Ives Ice Cream Co., 2nd and University Aves., S. E., A. H. Ives, Pres.—ice cream making equipment, including freezers, tanks, can washers, etc., for proposed addition to plant.

Miss., McComb—McComb Ice Co., V. G. Conner, Supt.—refrigerating machinery and equipment for proposed ice plant.

Mo., Kansas City—K. Prather, 302 Brotherhood Bldg.—tinner's tools, hand forming brake, rolls and compressor.

Mo., St. Louis—The Plateless Engraving Co., Victoria Bldg.—23 in. power paper cutter.

N. J., Camden—Camden Pottery Co., Mt. Vernon and Orchard Sts.—grinding machine, electric kilns and furnaces.

N. Y., Big Flats—H. B. Thomas—one concrete block making machine.

N. Y., Binghamton—Bd. Educ.—vocational equipment for proposed $350,000 school on Stan Ave.

N. Y., Elmira—M. Hutchison, 801 Winsor Ave.—one paper baling machine.

N. Y., Geneva—A. E. Meyers—sand digger and loading machine, gasoline driven (clamshell and boom type preferred).

N. Y., Penn Yan—Keuka Lake Ice Co.—machinery and equipment for conveying and handling ice, for proposed ice house.

N. Y., Rochester—Brighton Place Dairy Co., 1757 East Ave., refrigeration machinery and equipment for proposed plant.

N. Y., Rochester—A. W. Hopeman & Son, 575 Lyell Ave.—machinery and equipment for proposed fur tannery.

O., Caldwell—The Caldwell Collieries Co.—machinery and equipment for generating and hoisting plant at the Florence Mine, to replace that which was destroyed by fire.

O., Cleveland — Western Newspaper Union, 1279 West 3rd St.—model No. 1 linotype machine.

O., Columbus—The Columbus Auto Spring Co., 205 East Capital St., J. J. Puskar, Purch. Agt.—emery stand and blowers.

O., Columbus — Columbus Consumers' Supply Co., 315 North 4th St., (building supplies), R. H. Miller, Genl. Mgr.—full line of loading and unloading machinery for new branch yard at 1154 West Broad St.

O., Findlay—The Adam Axle Co.—$40,000 to $50,000 worth of machinery for proposed addition.

O., Youngstown—Commercial Shearing & Stamping Co., G. Ohl, Secy.—$30,000 worth of machinery.

Okla., Atoka—Atoka Press—newspaper equipment (used).

Okla., Tecumseh—C. Polaski—ice making machinery.

Okla., Tulsa—The National Refining Co. —machinery and equipment for 2 proposed electrical pumping plants.

Ore., Talent — The Talent Lumber Co., P. J. Neff, Medford, Ore., Secy.—machinery for proposed sawmill, here, 30,000 ft. capacity.

Pa., Ardmore—J. H. Clarke (contractor) —24 in. band saw with counter shafts, etc.

Pa., Bloomsburg—The Bloomsburg Paper Co.—machinery and equipment for proposed plant, to replace that which was destroyed by fire.

Pa., Canton—G. M. Coons Co.—additional machinery and equipment for sand and gravel plant.

Pa., Mahaffey—The Times—six column quarto newspaper press (used).

Pa., Mercer—Mercer Refining Co., c/o W. C. Hastings, Treas., Franklin, Pa., (oil refining)—pulleys and shafting machinery, hangers, belting chain and belt conveying machinery.

Pa., Phila.—The Adelphia Mfg. & Plating Co., Belgrade and Orthodox Sts.—additional foundry equipment for iron and brass.

Pa., Phila.—W. Boyle, 1141 Winston St. (printer)—one large paper cutter and one numbering machine.

Pa., Phila.—The Cocoanut Specialty Co., 1214 North Crese St. (manufacturer of confectionery)—shredding machinery, steam vats, packing machines, etc.

Pa., Phila.—Presbyterian Hospital, 39th St. and Powelton Ave.—complete laundry machinery and equipment.

Pa., Pittsburgh—M. K. Frank, 917 Frick Bldg., (iron and steel scrap)—1½ or 2 ton traveling electric crane to travel on single rail (new or used).

Pa., Pittsburgh—The Koppers Co., Union Arcade—air operated crane for the by-product plant of the Carnegie Steel Co. at Clairton.

Pa., Sharon—Maniscalco New Power System Co., M. & M. Bank Bldg.—special machinery for the manufacture of patented self generating electric motors.

Pa., Wallingford—The Sackville Mills Co. (manufacturer of textiles), M. E. Sack, Purch. Agt.—30 in. cloth folder machine.

Pa., Wilkes-Barre — Paradise Sweets, Inc., 24 West Union St., L. K. Salsburg, Dir.—candy and ice cream making equipment.

S. C., Conway — Horry Herald, H. H. Woodward, Purch. Agt.—six column quarto newspaper press.

S. C., Georgetown — The Times—30 in. standard paper cutter.

Tenn., Knoxville — The Appalachian Marble Co., Middlebrook Pk.—single head channeling machine.

Va., East Radford—The Journal—seven column chases, reglet case, leads, slugs and folder for newspaper.

Va., Glenallen — J. Frank Darling Co., (planing mill), J. F. Darling, Purch. Agt. —10 in. moulder and double service planer.

Va., Petersburg—J. E. Collier, 416 Short Market St.—nickel plating outfit.

Va., Petersburg—Nash Bros., 108 West Bank St.—power emery machine.

Va., Petersburg—Petersburg Builders Supply Co., 222 North Market St., A. Strailman, Purch. Agt.—planer.

Va., Richmond—Donnati Fiber Box Co., 3210 Williamsburg Ave.—machinery for the manufacture of fiber boxes, to replace that which was destroyed by fire.

Va., Richmond — R. E. Piper, 1522 West Broad St. (cornices and roofing)—cornice brake and large power shears.

Wash., Centralia — The H. H. Martin Lumber Co., H. H. Martin, Pres. and Genl. Mgr.—complete equipment for 100,000 ft. capacity saw and planing mill, prefer electrical drive for individual machines, logs up to 100 and 120 in. in diameter, must be handled by main saw and carriage.

W. Va., Princeton—T. M. Fry—ice cream machinery (used).

Wis., Green Bay—Knowlton Candy Co., c/o J. W. McNevins, 721 South Quincy St. —candy making machinery.

Wis., Madison—The Meyer Printing Co., 117 South Webster St.—printing presses, power driven, and equipment for addition to printing plant.

Wis., Madison—The State Bd. of Control, M. J. Tappins, Secy.—ice machine for proposed cold storage plant at Delevan.

Wis., Madison—Valvoline Oil Co., 815 East Main St.—oil storage tanks, pumps, etc., for proposed filling station.

Wis., Milwaukee—C. G. Forster, 62 27th St.—planing mill machinery.

Wis., Milwaukee—Northwestern Barrel Co., 76 South Bay St., (manufacturer of boxes and barrels), T. J. Verden, Purch. Agt.—2 or 3 band saws.

Wis., New Holstein—The New Holstein Canning Co., A. T. Hipke, Secy.—machinery for proposed canning factory.

Wis., North Milwaukee—E. Korth, Route 5, (carpenter and millworker)—band saw, about 32 in.

Wis., Oshkosh—R. A. Lutz, 1270 Knapp St.—machinery and equipment for new crushed stone plant.

Wis., Oshkosh—The Williams-Loper Co., 213 Harrison St.—special machinery for the manufacture of free-air stands, etc., for garages.

Wis., Sheboygan—The Northern Furniture Co., South Water St.—machinery, including power machinery, for proposed furniture factory at Tacoma, Wash.

Wis., West Bend—The West Bend Concrete Products Co.—machinery, including some power machinery, for the manufacture of drain tile and concrete products for proposed factory.

B. C. Powell River—The Powell River Co., Ltd.—machinery for proposed paper mill.

Ont., Kincardine—Kincardine Salt Wks. —$30,000 worth of equipment, piping, evaporators and special equipment for handling salt.

Que., Montreal—Dominion Steel Co., Canada Cement Bldg—$50,000 worth of equipment, to increase daily output of fence material from 60 to 120 ton, for Besco Wire mill at Sidney, N. S.

Metal Working Shops

Calif., San Francisco—J. Madison, 112 Market St., awarded the contract for the construction of a 3 story, factory on Harrison St. Pacific Meter Wks., 1123 Harrison St., lessee. Estimated cost $29,950. Noted Oct. 19.

Calif., San Francisco—A. J. Pahl, 37 Stevenson St., awarded the contract for the construction of a 2 story machine shop on Howard St. near 4th St. Estimated cost $25,000.

Calif., Stockton—H. S. Dawson, c/o G. Allen, Archt., 37 South Aurora St., is having plans prepared for the construction of a 3 story garage on North California and Oak Sts. Estimated cost $50,000.

Conn., New Britain—Landers, Frary & Clark, Commercial St., awarded the contract for the construction of a 6 story addition to its hardware and cutlery factory on Stanley St. Estimated cost $75,000.

Conn., New Haven—H. B. Ives & Co., 5 Artizan St., awarded the contract for the construction of a 4 story, 40 x 40 ft. and a 1 story, 30 x 80 ft. wing addition to its hardware factory. Cost from $35,000 to $40,000.

Conn., Norwalk—C. J. Mintz, 92 Washington St., South Norwalk, awarded the contract for the construction of a 1 story, 85 x 140 ft. garage on West Ave., here. Estimated cost $40,000.

Ind., Fort Wayne—The General Electric Co., Bway and Wall St., will build a 1 story, 150 x 150 ft. tank shop and garage. Estimated cost $30,000. Noted Oct. 12.

Ind., Lebanon—Cline & Hicks are having plans prepared for the construction of a 1 story, 60 x 100 ft., 40 x 40 ft. and 40 x 60 ft. paint and machine shops. Estimated cost $40,000. Private plans.

Ind., Lebanon—The Indestructible Wheel Co. is having plans prepared for the construction of a 2 story, 100 x 160 ft. addition to its factory for the manufacture of wire wheels. Estimated cost $60,000. Private plans.

Mass., Cambridge — The Auto Truck & Wagon Co., 141 First St., will soon award the contract for the construction of a 1 story, 85 x 100 ft. automobile body factory. Estimated cost $30,000. Private plans.

Mass., East Boston (Boston P. O.)—The Hersey Mfg. Co., 314 West 2nd St., awarded the contract for the construction of a 2 story plant for the manufacture of special machinery on E St. Estimated cost $25,000.

Mass., Somerville—J. W. Knowles, 660 Bway., awarded the contract for the construction of a 1 story, 90 x 150 ft. garage, etc., on Highland Ave. and Eastman Rd. Estimated cost $40,000.

Mass., Worcester—A. A. Wheeler, 159-163 Mechanic St., awarded the contract for the construction of a 2 story garage and service station. Estimated cost $100,000.

Mich., Detroit—The Pennsylvania R.R., 1368 Penobscot Bldg., is having plans prepared for the construction of a 1 story, engine and round house, including turntable, water tower, coaling station and handling equipment, on 19th St. B. V. Sommerville, 1368 Penobscot Bldg., Engr.

N. Y., Buffalo—D. Bunshaft, 55 Manchester Pl., plans to build a 1 and 2 story, 66 x 100 ft. garage on Clinton St. Architect not announced.

N. Y., Buffalo—The Chevrolet Motor Co., Buffalo, and West Grand Blvd., Detroit, Mich., is having plans prepared for the construction of a 1 and 2 story, 338 x 900 ft. automobile factory and loading platform on East Delevan Ave., here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

N. Y., Buffalo—The Empire Drawn Steel Corp., 1133 Marine Bank Bldg., is having plans prepared for the construction of a 1 story, 70 x 450 ft. cold drawn steel factory on Germania St., capacity 36,000 tons annually. Estimated cost $100,000. Harding & Crea, White Bldg., Engrs.

N. Y., Buffalo—P. M. McGroff, Montreal, Que., plans to build a steel wire factory, here. Estimated cost $1,000,000. Architect not selected.

N. Y., New York—W. F. Harving, c/o J. P. Whiskeman, Engr. and Archt., 153 East 40th St., will build a 1 story, 135 x 150 ft. garage on Webster Ave. Estimated cost $75,000.

N. Y., New York—S. M. DePasquale, c/o S. J. Kessler, Archt. and Engr., 529 Courtlandt Ave., will build a 2 story garage on Webster Ave. and Moshula Parkway. Estimated cost $120,000

O., Cleveland—The Denby Wire & Iron Co., 5119 Euclid Ave., has had plans prepared for the construction of a 1 story, 40 x 105 ft. factory at 3005 East 81st St. Estimated cost $40,000. H. Denby, owner.

O., Cleveland—F. Svoboda, 5377 Bway., awarded the contract for the construction of a 2 story, 45 x 139 ft. garage on Bway. and Mumford Ave. Estimated cost $60,000. Peck & Horton (Ford dealers), 2261 East 14th St., lessee. Noted Sept. 21.

O., Findlay—The Adam Axle Co. plans to build an 80 x 200 ft. addition to its factory. Cost will exceed $50,000.

O., Salem—The Deming Co., Etna St., manufacturer of pumps, awarded the contract for the construction of a 1 story foundry. Estimated cost $50,000.

Pa., Enola—The Pennsylvania R.R., Broad St. Sta., Phila., awarded the contract for the construction of a 100 x 620 ft., car building shop, and four 1 story 16 x 31 ft., 16 x 61 ft., 100 x 424 ft. and 42 x 402 ft. buildings, for repairing cars, etc., here.

Pa., Oil City—The Oil City Boiler Wks., 351 Seneca St., awarded the contract for the construction of a 1 story, 60 x 75 ft. addition to its boiler plant.

Pa., Phila.—C. Kahn, Morris Bldg., awarded the contract for the construction of a 2 story, 21 x 200 ft. sales and service building at 1618 North Broad St. Estimated cost $75,000.

Pa., Phila.—The Nash Motor Co., 901 North Broad St., awarded the contract for the construction of a 5 story, 75 x 160 ft. sales and service station on Broad and Thompson Sts. Estimated cost $300,000.

Pa., Pitcairn—The Pennsylvania R.R., Broad St. Sta., Phila., awarded the contract for the construction of a 13 x 25 ft. oil house, and 100 x 620 ft., 16 x 31 ft. 16 x 61 ft., 100 x 424 ft., and 42 x 202 ft. buildings for constructing and repairing cars, etc., all 1 story, here. Noted Oct. 5.

Pa., Pittsburgh—The Harmony Creamery Co., 407 Liberty Ave., awarded the contract for the construction of a 2 story, 56 x 115 ft. garage on Reedsdale St. Estimated cost $40,000.

Pa., Pittsburgh—The Jones & Laughlin Steel Co., 3rd Ave. and Ross St., will build a 1 story, 100 x 150 ft. addition to its polishing plant on 2nd Ave. (Hazelwood). Estimated cost $25,000.

Pa., Pittsburgh — The Webster Ave. Garage Co., c/o A. Ricordino, 1010 Webster Ave., awarded the contract for the construction of a 2 story, 40 x 110 ft. garage. Estimated cost $40,000.

Pa., Youngwood—The Robertshaw Mfg. Co. is receiving bids for the construction of a 1 story, 30 x 65 ft. and 110 x 130 ft. foundry and machine shop. Amer. City Eng. Co., Peoples Bank Bldg., Pittsburgh, Archts.

R. I., Providence—The Olneyville Realty Co., Inc., 18 Plainfield St., awarded the contract for the construction of a 1 story, 60 x 175 ft. garage, etc. Estimated cost $40,000. Noted Oct. 5.

Tenn., Memphis—The Louisville & Nashville R.R., Louisville, Ky., plans new round house near here, also switch tracks and car repair shops near coaling plant, at Leewood. Estimated cost $250,000. A. B. Scates, supt. Memphis div. W. H. Courtenay, Louisville, Ch. Engr.

Wis., Chippewa Falls — The Chippewa Valley Auto Co., 16 River St., is receiving bids for the construction of a 2 story, 124 x 130 ft. garage. Estimated cost $75,000. F. A. Bigler, Pres. E. J. Hancock, Laycock Bldg., Eau Claire, Archt.

Wis., Montfort—O. Yerke will build a 1 story, 50 x 60 ft. garage and repair shop. Estimated cost $40,000.

Wis., Oshkosh—The Williams-Loper Co., 213 Harrison St., awarded the contract for the construction of a 2 story, 45 x 80 ft. factory for the manufacture of air pressure tanks, etc., for garages. Estimated cost $15,000.

Wis., Milwaukee—F. Kraning, 1147 Forest Home Ave., awarded the contract for the construction of a 2 story, 30 x 80 ft. addition to garage. Estimated cost $40,000. Noted Oct. 12.

Wis., Milwaukee—Leenhouts & Guthrie, Archts., 424 Jefferson St., are receiving bids for the construction of a 1 story, 120 x 120 ft. garage, for the Luick Ice Cream Co., 183 Ogden Ave. Estimated cost $60,000. Noted Oct. 5.

Wis., Milwaukee—C. F. Ringer & Son, Archts., 432 Bway., are receiving bids for the construction of a 1 story, 50 x 150 ft. garage on 9th St., for the O. Jaeger Baking Co., 914 Central Ave. Estimated cost $40,000.

Wis., Rhinelander — The Wisconsin Regrinding Co. will build a 1 story, 50 x 90 ft. machine shop, here. Estimated cost $40,000. A. P. Schneidewind, Sheboygan Falls, Pres. Private plans. Noted Oct. 5.

Ont., Toronto—The Ford Motor Co. of Canada, 672 Dupont St., plans to build a 1 story, 350 x 650 ft. motor factory on Danforth Ave. Estimated cost $500,000.

General Manufacturing

Calif., Pittsburg—The Pioneer Rubber Mills awarded the contract for the construction of a factory. Estimated cost $141,000. Noted June 29.

Calif., San Francisco—C. E. Lewis, 306 Sacramento St., awarded the contract for the construction of a 2 story, 25 x 120 ft. glove factory on Folsom St. Estimated cost $6,000. Noted Oct. 19.

Calif., San Francisco—MacDonald & Kahn, 130 Montgomery St., awarded the contract for the construction of a 3 story, 50 x 182 x 218 x 275 ft. office, studio and workshop building on Pierce, Steiner, Turk and Eddy Sts. Foster & Kleiser Co., billboard erectors and advertising experts, 287 Valencia St., lessee.

Calif., Tracy—The General Milk Co., of California, c/o A. J. Mazurette, Archt., 1002 H St., Modesto, will soon receive bids for the construction of a condensary plant. Estimated cost $75,000. Noted March 23.

Colo., White River (Meeker P. O.)—The Rio Blanco Carbon Co., 818 Symes Bldg., Denver, is having plans prepared for the construction of a 1 story, 12 x 16 ft. and 14 x 110 ft. and a 2 story, 20 x 40 ft. plant for the manufacture of carbon black, here. Estimated cost $60,000. O. D. Horton, 714 Commerce Bldg., Erie, Pa., Engr.

Conn., Bridgeport—The Huber Ice Cream Co., 800 Seaview Ave., awarded the contract for the construction of a 3 story, 60 x 102 ft. addition to its ice cream factory. Estimated cost $100,000. Noted Oct. 19.

Conn, Hartford—The **Frisbie Pie Co.**, 363 Kossuth St., Bridgeport, is receiving bids for the construction of a 2 story, 90 x 100 ft. bakery and warehouse, including portion for garage and washroom, here. Estimated cost $50,000. Private plans.

Conn., Middletown—M. Bornstein & Sons, 40 Gray St., Paterson, N. J., are having plans prepared for the construction of a 1 story, 60 x 200 ft. addition to their silk mill, here. Estimated cost $40,000. Private plans.

Conn., Naugatuck—The Goodyear India Rubber Glove Co., 58 Maple St., awarded the contract for the construction of a 3 story, 60 x 110 ft. addition to its factory, for the manufacture of rubber goods. Estimated cost $75,000.

Conn., Waterford—J. and G. H. Bathgate, Jordan Mill, awarded the contract for the construction of a 2 story, 40 x 141 ft. addition to its textile mill. Estimated cost $50,000.

Fla., New Smyrna—The Volusia Cypress Co. plans to build a saw mill, planing mill and lumber plant. Estimated cost $100,000.

Ill., Chicago — E. E. McClellan, Archt., 7441 Cottage Grove Ave., is receiving bids for the construction of a 1 and 2 story, 200 x 200 ft. addition to ice cream factory, for the Victory Ice & Ice Cream Co., 15th St. and Keeler Ave. Estimated cost $100,000.

Ill., Chicago—The McDonald Loose Leaf Co., 638 Federal St., awarded the contract for the construction of a 1 story, 95 x 125 ft. factory at 1809-17 Summerdale Ave. Estimated cost $50,000. Noted Sept. 14.

Ind., Bedford—The Indiana Quarries Co. awarded the contract for the construction of a 1 story, 400 x 600 ft. stone mill. Estimated cost $400,000. Noted Sept. 14.

Ind., Elkhart—The Curtain Supply Co. awarded the contract for the construction of a 1 story, 172 x 400 ft. curtain factory. Estimated cost $100,000. Noted Oct. 12.

Ind., Fort Wayne—The Wayne Oil Tank & Pump Co., Anthony Hotel, awarded the contract for the construction of a 1 story, 50 x 320 ft. paint factory addition. Estimated cost $40,000. Noted Oct. 12.

Mass., Gardner—G. E. O'Hearn, 92 Oak St., awarded the contract for the construction of a 1 story, 50 x 210 ft. factory, for the manufacture of novelties, on Parker St. Estimated cost $40,000.

Mass., Worcester—The Queensbury Mills, Inc., Quinsigamono Ave., plans to build several large additions to its yarn plant. Architect not selected.

Minn., Minneapolis—**The Ives Ice Cream Co.**, 2nd and University Aves., S. E., awarded the contract for the construction of a 3 story, 40 x 76 x 117 ft. addition, and for adding 3rd story to present 41 x 117 ft. building. Estimated cost $74,000. A. H. Ives, Pres. Noted July 13.

N. H., Plaistow — The Merrimack Clay Products Co., 185 Devonshire St., Boston, will soon award the contract for the construction of a 1 and 2 story, 200 x 600 ft. plant for the manufacture of clay and hollow tile products, here. Estimated cost $200,000. Morse & Chase, 25 Washington Sq., Haverhill, Mass., Archts. Noted June 29.

N. Y., Brooklyn—The Brooklyn Daily Eagle, Eagle Bldg., awarded the contract for the construction of a 6 story, 83 x 111 ft. publishing plant on Adams and Johnson Sts.

N. Y., Rochester—A. W. Hopeman & Son, 575 Lyell Ave., plan to build a fur tannery. Estimated cost $16,000. Architect not announced.

O., Caldwell—The Caldwell Collieries Co. plans to rebuild its generating and hoisting plant at the Florence Mine, which was destroyed by fire. Estimated cost $70,000.

O., Euclid—The Municipal Realty Co., c/o A. Bloom, Supt. of Constr., Hanna Bldg., will build a 1 story warehouse and lumber mill on Bliss Rd. and St. Clair Ave. Estimated cost $150,000. Private plans.

Ore., Talent — The Talent Lumber Co. plans to build a saw mill, 30,000 ft. capacity. P. J. Neff, Medford, Secy.

Pa., Bloomsburg—The Bloomsburg Paper Co. plans to rebuild its paper factory, which was destroyed by fire. Estimated cost $75,000.

Pa., Phila.—The Cocoanut Specialty Co., 1214 North Crese St., will soon receive bids for the construction of a 4 and 6 story, 80 x 180 ft. factory, for the manufacture of cocoanut specialties, at Wayne Junction. Estimated cost $250,000. Lachman & Murphy, Drexel Bldg., Archts.

Pa., Phila.—A. A. Zimmerman, Archt., 85 9th Ave., New York City, will receive bids Nov. 1 for the construction of an 8 story, 150 x 256 ft. bakery for the National Biscuit Co., Broad St. and Glenwood Ave., here. Estimated cost $500,000.

Pa., Reading—The Central Abattoir Co., Chestnut St., awarded the contract for the construction of a 3 story packing plant. Estimated cost $175,000. Noted July 20.

Pa., Rikers (Punxsutawney P. O.)—The Buffalo, Rochester & Pittsburgh R.R., 20 State St., Rochester, N. Y., awarded the contract for the construction of a coaling station, 1,200 ton capacity, here.

Pa., Sharon—The Valley Packing & Provision Co., 114 Franklin St., awarded the contract for the construction of a 2 story, 54 x 106 ft. addition to its packing plant. Cost will exceed $10,000. Noted June 29.

R. I., Woonsocket — The Glenbrook Worsted Mills, Mason St., awarded the contract for the construction of a 1 story, 30 x 125 ft. addition to its plant. Estimated cost $25,000.

Tenn., Carthage — The Carthage Spoke Co. increased its capital stock from $50,000 to $100,000 for additions, machinery and improvements to plant. A. Bilbrey, Supt.

Tenn., Memphis—Clover Farm Dairy Co., 789 Union Ave., is building a 3 story creamery and ice cream factory on Orleans and Beale Sts. Estimated cost $80,000.

Tex., Deweyville — Peavy-Moore Lumber Co. plans to rebuild saw and lumber mill to replace the one which was recently destroyed by fire. Estimated cost $200,000.

Va., Richmond—The Fibre Board Container Co., 3200 Williamsburg Ave., manufacturer of boxes, awarded the contract for the construction of a 3 story, 50 x 150 ft. plant to replace the one which was recently destroyed by fire. Estimated cost $20,000.

Wash., Tonasket—The Standard Oil Co., Realty Bldg., Spokane, has had plans prepared for the construction of a 1 story, 40 x 60 ft. distributing station, including tanks, etc., here. Estimated cost $20,000. C. E. McKay, Realty Bldg., Spokane, Engr.

W. Va., Clarksburg—The Clarksburg Exponent Publishing Co. awarded the contract for the construction of a 2 story, 62 x 150 ft. printing plant on Hewes St. Estimated cost $50,000.

W. Va., Princeton—The Princeton Hosiery Mills Co. plans to build a 2 story, 50 x 150 ft. hosiery mill. Private plans.

W. Va., Wellsburg—The Hammond Bag & Paper Co., Box 467, awarded the contract for the construction of a 1 story, 125 x 350 ft. paper mill.

W. Va., Wheeling—The Interstate Oxygen Co. awarded the contract for the construction of a 1 story, 100 x 150 ft. oxygen factory, on 44th and Eoff Sts. Estimated cost $50,000.

W. Va., Wheeling—The Wheeling Box Co., 3007 Chapline St., will build a 2 story, 40 x 175 ft. addition to its box factory. Estimated cost $10,000.

Wis., Clyman — The Reeseville Canning Co., Reeseville, will build a vegetable canning plant, consisting of a 70 x 162 ft. warehouse, a 70 x 120 ft. machine room, a 64 x 90 ft. boiler house, all one story, also miscellaneous sheds. Estimated cost $75,000. Noted Oct. 12.

Wis., Granville—The Rauschenberger Tire Co., Akron, O., plans to build a 3 story, 150 x 175 ft. factory here, for the manufacture of auto tires. Estimated cost $150,000. Architect not selected.

Wis., Green Bay—The Fort Howard Paper Co., South State St., awarded the contract for the construction of a 3 story, 100 x 140 ft. paper finishing plant. Estimated cost $100,000.

Wis., Horicon—The Allen-Spiegel Shoe Co., Belgium, plans to build a 2-3 story, 60 x 150 ft. shoe factory, here. E. W. Allen, Mgr. Architect not selected.

Wis., Menomonee Falls—Pure Milk Co., c/o A. E. Johnson, Pres., 722 41st St., Milwaukee, awarded the contract for a 1 story, 42 x 80 ft. milk bottling plant, here. Estimated cost $20,000.

Wis., Milton—The Burdick Cabinet Co. awarded the contract for the construction of a 1 story, 80 x 160 ft. factory addition. Estimated cost $45,000. Noted Sept. 21.

Wis., Milwaukee—Waukesha Dairy Co., 342 6th St., awarded the contract for the construction of a 4 story, 50 x 78 ft. addition to its dairy. Estimated cost $50,000.

Wis., Park Falls—The Flambeau Paper Co. awarded the contract for the construction of a 2 story, 50 x 95 ft. pulp mill. Estimated cost $100,000. G. Waldo, Mgr.

Wis., South Milwaukee—The Burnham Bros. Brick Co., 68 Wisconsin St., awarded the contract for the construction of a 1 story, 85 x 100 ft. dryer plant, on Chicago Rd. Will build a machine building, power house and brick burning building in near future. Noted Dec. 15, 1921.

Ont., Hanover—The Peninsular Cord Tire Co. plans to build a new factory. Estimated cost $100,000. W. A. Oakley, Mgr.

Ont., London—The Corrugated Carton Co., York and Glenbe Sts., is having plans prepared for the construction of a factory. Estimated cost $60,000.

Ont., St. Thomas—The City Gas Comn., will vote on a bylaw Dec. 1 for the rebuilding of civic gas plant and the installing of vertical retorts. Estimated cost $100,000. W. A. McIntyre, City Hall, Chn. W. Miller, City Hall, Engr. Noted Sept. 14.

Ont., Sault Ste. Marie—F. W. Reese and T. J. Wilcox plan to build a gas plant. Estimated cost $200,000.